
NESHAMINY CREEK BIKE/HIKE TRAIL

as part of the implementation of the
PENNSYLVANIA COASTAL ZONE MANAGEMENT PROGRAM



DECEMBER 1983

Prepared for:

Bensalem Township Parks and Recreation Board
Bensalem Township
Bucks County, Pennsylvania

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I. INTRODUCTION

The proposed Neshaminy Creek Bike/Hike Trail project is located along the west side of the Neshaminy Creek in Bensalem Township, Bucks County, Pennsylvania. Bensalem Township is a Coastal Zone Community, as determined by the Pennsylvania Department of Environmental Resources, Coastal Zone Management Program, due to its frontage along the Delaware River as well as its frontage on the Neshaminy Creek, a tributary to the Delaware River. This area is within the Delaware Estuary and, therefore, is affected by tidal movement.

The Coastal Zone Management Program has determined recreation to be an important land use within the Delaware Estuary Coastal Zone. The Coastal Zone Management Program and Final Environmental Impact Statement has indicated that pressures for additional recreational sites are expected to increase in the future as travel becomes increasingly more expensive and as water quality in the Delaware Estuary improves in response to Federal, State and local programs and investments.

The Final Environmental Impact Statement, Public Access for Recreation (II-2-17) further states that both nationally and within Pennsylvania there is a growing demand for access to the shore-front of Lake Erie and the waterfront of the Delaware River. People seek access not only for traditional recreational pursuits such as boating and fishing, but increasingly for more passive forms of recreation such as walking, picknicking, or just viewing the water. Some Impact Statement Policies are as follows:

POLICY III - 3: DIRECT ACTION

It is the policy of the Coastal Zone Management Program to improve access to the Delaware Estuary and the Lake Erie waterfronts through the acquisition of new sites and/or the expansion of existing sites.

POLICY V - 1: DIRECT ACTION

It is the policy of the Coastal Zone Management Program to provide additional public access opportunities along the waterfronts of Lake Erie and the Delaware River for active recreation such as swimming, fishing, and boat launching, as well as for more passive activities such as sightseeing and picnicking.

POLICY V-2: ENCOURAGEMENT

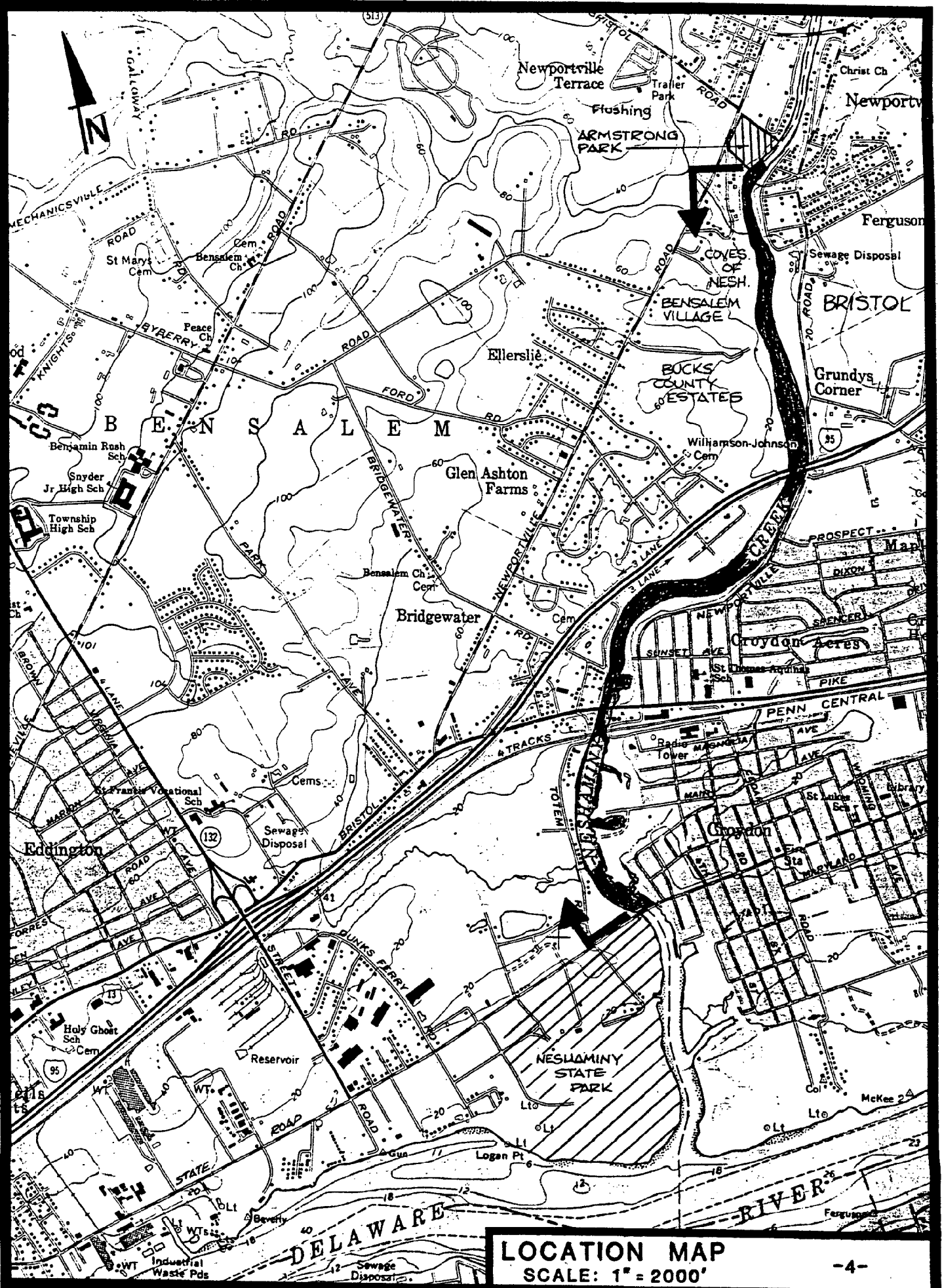
It is the policy of the Coastal Zone Management Program to give high priority to acquisition and/or development of GAPC's, nominated as areas of significant natural value, and areas of historical, cultural or recreational significance, to provide public access opportunities for active and/or passive forms of recreation.

POLICY IX-A: ENFORCEMENT/REGULATIONS

It is the policy of the Coastal Zone Management program to initiate a program of "State Consistency" to ensure that all State administrative departments and independent administrative boards and commissions and other State agencies shall enforce and act consistently with the enforceable policies of the Pennsylvania Coastal Zone Management Program.

The Bensalem Township Parks and Recreation Board has retained the services of Carroll Engineering Corporation to prepare this Feasibility Study and Site Development/Design Plan for construction of the Bike/Hike Trail. The preparation of this report was financed through the Pennsylvania Coastal Zone Management Program under the provisions of the Federal Coastal Zone Management Act of 1972, (as ammended) administered by the Division of Coastal Zone Management, Bureau of Water Resources Management, Pennsylvania Department of Environmental Resources.

The Neshaminy Creek Bike/Hike Trail follows the west side embankment of the Neshaminy Creek linking James Armstrong Memorial Park and Neshaminy State Park. The distance along the creek between the two parks is approximately 2-3/4 miles. See Location Map, Page 4 for more detail.



LOCATION MAP
SCALE: 1" = 2000'

II. PROJECT SCOPE

The work objectives of this project are to examine the feasibility of developing the Bike/Hike Trail along the Neshaminy Creek, linking James Armstrong Memorial Park and Neshaminy State Park, including specific recommendations regarding development of the project.

A complete site inventory of existing natural and man-made site features has been collected and analyzed. This information is the basis for determining trail location, access and parking location, and other related project features.

This study has been prepared with the cooperation of the Pennsylvania Department of Environmental Resources, Bureau of Water Resources Management, Coastal Zone Management Program; the Bensalem Township Parks and Recreation Board; Neshaminy State Park; and the Delaware Valley Regional Planning Commission's Urban Waterfront Action Group. Other organizations involved with the preparation of this study are: The Pennsylvania Natural Diversity Inventory, the Army Corps of Engineers, the National Marine Fisheries Service, the Pa. Department of Environmental Resources' Bureau of Dams and Waterway Management, U.S. Fish and Wildlife Service, the Pennsylvania Historical and Museum Commission, the Bucks County Conservancy, and the Pennsylvania Department of Transportation.

III. SITE INVENTORY AND ANALYSIS

A. General

Carroll Engineering Corporation personnel visited the project site on four different occasions. Others present during site visits were representatives from DER and the Army Corps of Engineers, the Chairman of the Bensalem Township Parks and Recreation Board, the Superintendent of Neshaminy State Park, and the Acting Director of Bensalem Township Parks and Recreation Department. Information gathering and defining was done primarily through the site visits, review of pertinent reports and studies and through meetings with the Urban Waterfront Action Group, the Bensalem Township Parks and Recreation Board, and the DER - Division of Coastal Zone Management.

Upon complete gathering, documentation and mapping of site inventory material, all information was analyzed. Information regarding both the natural and man-made features was analyzed in order to determine how they may affect and/or be affected by a bike/hike trail.

B. Ownership of Land/Existing Land Uses

There are four classifications of land ownership in the project area: 1) State owned; 2) Township owned; 3) Privately owned - occupied; 4) Privately owned - vacant. (See plans; sheets 4,5,6; Appendix 3.) Appendix 1 shows tax parcel numbers and property owners. A Bucks County Water and Sewer Authority sanitary sewer interceptor easement traverses most of these properties.

Other man-made features include houses and buildings on occupied parcels. Some residents (along the Totem Road section of the project) have private boat docks on the creek. A marine business (Jack's Marina), located on Totem Road just north of Bristol Pike, has a boat launch and docks.

1. State Owned Property

State owned property consists of Neshaminy State Park, Interstate 95 right-of-way, Bristol Pike right-of-way, Totem Road right-of-way, and State Road right-of-way.

Neshaminy State Park offers active and passive recreation for public use. Some of the amenities include:

- roads and trails
- parking lots
- picnic and cookout areas
- fishing areas
- three swimming pools: olympic, diving and baby (cost to use swimming pools is \$1.25 per person per day)
- marina - for 160 boats (plus 30 proposed additional slips).
- public boat launch
- nature trail along the Neshaminy Creek
- fields for free play
- Playmaster (building in which plays are performed during the winter months)

Encroachment upon road rights-of-way under the jurisdiction of the Pennsylvania Department of Transportation will require securing a Highway Occupancy Permit.

2. Township Owned Property

Township owned property includes James Armstrong Memorial Park, open space of the Coves of Neshaminy residential development, and open space of Bucks County Estates residential development.

Armstrong Park is presently in need of restoration, but is used by some residents for basketball, fishing and picnicking. The Township has approved plans to reconstruct the park. Construction of Armstrong Park is dependent upon availability of funding. A 1982 cost estimate for complete restoration and new construction including final Engineering is \$290,375.00. After complete construction, the park could offer:

- cookout areas
- basketball
- fishing
- bicycle trails
- nature trails
- canoe launch
- ice skating
- parking
- passive recreation

The Coves of Neshaminy is a multi-family residence development. When the property was subdivided, an open space area adjacent to the Neshaminy Creek was dedicated to the Township. The open space area consists of a natural creek edge with trees and understory brush, grassy field areas, a softball field, and a basketball court.

Bucks County Estates is a single family residence development. Like the Coves of Neshaminy, open space was dedicated to the Township when subdivided. The open space area is also adjacent to the creek. The area is heavily wooded and has scrub brush near the creek edge. The area contains no man-made features other than the sewer interceptor.

3. Privately Owned - Occupied

The privately owned and occupied properties consist primarily of single family dwellings. There are also a marina and a few businesses in the southern portion of the site area. The properties on Totem Road are developed extensively from Totem Road to the creek edge, thereby making it necessary for the trail to follow Totem Road.

Several properties adjacent to Bridgewater Road (north of Totem Road) provide adequate open area near the creek for the trail to pass through but would necessitate the acquisition of easements by the Township. Bensalem Village, a multi-family residence development located adjacent to the northern property line of Bucks County Estates, provides

recreational open space along the creek. The Bensalem Village private open space area consists of a community building, swimming pool, tennis courts, horseshoe pits, open grassy field and a natural creek edge. If the trail could be aligned to fall near the creek edge, it would not interfere with existing activities. An easement would be necessary to permit the trail to traverse the property. Another option would be to construct a boardwalk out over the water along the creek's edge.

4. Privately Owned - Vacant

Most of the properties within the project area are privately owned - vacant. These properties fall within the 100-year flood plain. Most areas are primarily in a natural state of woodlands, scrub brush areas, and grassy areas. There are trails through some of these properties apparently formed by children playing and riding bicycles. Easement acquisition will be required in some of these areas. Current zoning and subdivision standards prohibit erection of buildings within the 100-year flood plain.

C. Topography/Surface Hydrology

The majority of the site area is level to gently sloping with slopes under 3%. Some portions of the site have steep slopes (over 15%), particularly in several areas in and adjacent to Armstrong Park where high ground drops off quickly

to the creek edge. Other steep slopes occur where the I-95, Bristol Pike railroad, and State Road bridges cross the creek. These slopes are filled embankments. Steep slope areas can be made accessible for hiking, but not bicycling.

There are four predominant streams or swales flowing into the Neshaminy Creek within the project area. Mill Creek flows into the Neshaminy just south of Armstrong Park, making it necessary for the trail to cross Mill Creek via the Flushing Road bridge. Two prominent swales drain into the Neshaminy south of I-95 between Dunston Road and Totem Road. These swales can be avoided by aligning the trail towards the more easterly higher elevations, or the swales could be crossed by construction of a foot bridge or installation of a storm drainage pipe. Any such construction would require securing permits from the Army Corps of Engineers, and DER Dams and Waterway Management. Permits which may be required are listed in Section VIII, Conclusions, of this Report. Another tributary enters the Neshaminy passing under a Totem road bridge between Bristol Pike and State Road, thus requiring the trail to cross the Totem Road bridge.

D. Soils

The soil mapping, classifications, and descriptions are as outlined in the Soil Survey of Bucks and Philadelphia Counties, Pennsylvania, prepared by the United States Department of Agriculture, Soil Conservation Service. This information is intended to provide general guidance to government officials and

developers who are concerned with selecting suitable sites for various purposes. The information and soil maps give general guidance and should be used only in conjunction with more detailed field investigations.

1. Soil Classification

- AgA - Alton gravelly loam - 0 to 3 percent slope
- Fa - Fallsington silt loam - gravelly subsoil variant
- Ha - Hatboro silt loam
- Mh - Marsh
- Ub - Urban land

2. Soil Descriptions (See Plans; sheets 1, 2, 3; Appendix 3)

Alton Series

The Alton series consists of deep, well-drained, nearly level to gently sloping soils on outwash terraces. These soils are in the Delaware River Valley. They formed in very gravelly outwash material derived from shale, sandstone, quartzite, and some limestone.

Runoff is slow to medium, and the hazard of erosion is slight to moderate. The available water capacity is low, and permeability is rapid. Coarse fragments and low available water capacity are limitations to most nonfarm uses of these soils.

Fallsington Series, Gravelly Subsoil Variant

The gravelly subsoil variant of the Fallsington series consists of deep, poorly drained, nearly level soils on terraces on the Coastal Plain. These soils are mainly in slight depressions and at the base of low slopes. They formed in loamy material of mixed old Coastal Plain sediment. The subsoil contains many coarse fragments.

Runoff is slow and the hazard of erosion is slight. A variable water capacity is moderate, and permeability is moderate. The water table generally rises to or very near the surface during wet seasons. Wetness is a limitation to most nonfarm uses of these soils.

Hatboro Series

The Hatboro Series consists of deep, poorly drained, nearly level soils on flood plains. These soils are mainly found along small meandering streams. They formed on loamy alluvium that washed from upland soils underlain by gneiss, schist, and diabase.

Marsh

Marsh (Mh) soils are found along shorelines subject to ponding or tidal overflow, or in depressions where runoff collects. The soil material is variable, but it consists mostly of loamy to clayey marine and alluvial deposits. It is always very wet. Areas are irregular in shape and range from 5 to 100 acres or more in size.

Reeds, cattails, and other grasslike wetland plants grow on Marsh. It is much too wet for cultivation, but is suited to wildlife or aesthetic uses.

Urban Land

Urban land is in highly built-up areas of Bucks and Philadelphia Counties. Most Urban land is on terraces of the uplands and Coastal Plain; however, some is on the flood plain. The soils and foundation materials are highly variable. Urban structures and works cover so much of this land type that identification of the soils is not practical. Most areas have been smoothed, and the original soil material has been disturbed, filled over, or otherwise destroyed prior to construction.

Urban land is used for homesites, shopping centers, schools, factories, roads, cemeteries, golf courses, railroads, and other industrial facilities. The southern part of Bucks County and nearly all of Philadelphia County have the largest concentration of Urban land.

The Soil Survey provides information useful in planning outdoor recreational facilities. Soil limitations for "Paths and Trails in Camping Areas" found in the Soil Survey under "Degree and Kind of Limitations for Recreational Facilities", (Table 8, Soil Survey) are listed on Page 14.

Soil Series and
Map Symbols

Degree and Kind of Limitations/
Paths and Trails in Camping Areas

AgA	Moderate: gravelly
Fa	Severe: high water table
Ha	Severe: high water table; flooding
Mh	Severe: high water table
Ub	Too variable: on-site investigation required

E. Flood Plain/Wetlands

The 100-year flood plain, as determined by the U.S. Department of Housing and Urban Development, Federal Insurance Administration, has been evaluated and transposed onto the project plans. The 100-year flood line varies in distance from the creek from 35 feet to 750 feet in the project area. At areas where the terrain is most steep, the flood line is close to the creek. This occurs along a portion of Totem Road, approximately 1/4 mile north of the intersection of Totem and State Roads. The flood line is also near the creek at areas which have been filled for construction of bridges - State Road, Bristol Road, Interstate 95, and the railroad.

At areas of very flat terrain, the 100-year flood line extends far beyond the creek embankment. This occurs predominantly at a large area around Dunston Road, an area just north of the I-95 Bridge, and an area just south of James Armstrong Memorial Park.

Some of the wetland areas have been mapped and documented by the National Wetlands Inventory, U.S. Department of the Interior (see Plans; sheets 7, 8, 9; Appendix 3). The Neshaminy Creek itself, within its own banks, is classified as R1OW:

Ecological System - Riverine

Ecological Subsystem - Tidal

Class - Open Water/Unknown Bottom

Five other specific areas located in or near the 100-year flood plain (see plans) are classified as PF01:

Ecological System - Palustrine

Ecological Subsystem - (none)

Class - Forested

Subclass - Broad-leaved Deciduous

Wetlands, in general, make up a natural resource of national and statewide significance. They can provide fish and wildlife habitats, natural flood control, improved water quality, groundwater recharge, and environmental diversity. Wetland areas mapped by the National Wetlands Inventory are general locations. The wetland areas mapped within the project area must be investigated on-site by the Army Corps of Engineers and DER

to determine their significance. It may be necessary to secure Army Corps and DER permits due to wetland impacts (See Section VII, Conclusions, for list of possible permits) Members of the Urban Waterfront Action Group recommend avoiding construction in determined wetland areas and keeping the trail on higher site elevations where possible. The Urban Waterfront Action Group is made up of State and Federal agencies having an interest in development within the Delaware Estuary.

F. Vegetation

Most of the project area is undeveloped and consists of natural vegetation. There are deciduous woodlands consisting primarily of maple, sycamore, oak, and ash. In the Armstrong Park area there are some very old, large sycamore trees (30" plus caliper). The wooded areas would provide a desirable environment for the trail. Canopy protection would provide shade and a sense of seclusion for hikers and picnickers.

There are many species of understory shrubs and grasses. The Pennsylvania Natural Diversity Inventory (PNDI) has no rare plant occurrences listed for the project area (see Correspondence; Appendix 2.) However, directly downstream within the Neshaminy State Park bounds, the PNDI has 1982 records for Sagittaria calycina (Arrow-Head) and Sagittaria subulata (Subulata Arrow-Head) both being proposed for state endangered plant status. Field surveys from 1982 also verified the existence of Zizania aquatica (Indian Wild Rice) proposed state rare plant, Bidens bidentoides (Swamp Beggar - Ticks) proposed state

endangered plant, Amaranthus cannabinus (Waterhemp Ragweed) proposed state rareplant, Isoetes ripana (River-Bank Quilwort) proposed state endangered plant, and a Freshwater Interdidal Mudflat community. The PNDI indicated that if heavy silt from upstream disturbance occurred, it would affect plant life.

Prior to construction, a statement from the Bucks County Conservation District indicating that final engineering plans show adequate erosion and sedimentation control will be required (for earth disturbances of less than 25 acres.) If 25 acres or more are to be disturbed at one time DER Bureau of Soil and Water Conservation permit will be required.

The PNDI cannot provide a definitive statement on the presence, absence, or degree of health of environmental elements without on-site investigations.

The PNDI would welcome the coordination of a comprehensive field survey. Any such survey for plant material identification would have to be done during the spring season.

The trail should be carefully aligned so as not to disturb any occurrence of rare plants. However, the trail could provide access for observation and intellectual recreation should such plant materials be present.

G. Wildlife

Upon conferring with a Neshaminy State Park Ranger, a list of fish and wildlife was compiled. These fish, birds and mammals

are known to exist at Neshaminy State Park and the adjacent Neshaminy Creek. It is assumed that the presence of these fish and wildlife is typical of other portions of the site area.

Fish/Shellfish - carp, suckers, largemouth bass, swallowmouth bass, catfish, bluegill, eel.

The Pennsylvania Natural Diversity Inventory has indicated that there is a possibility of clams (*Alasmidonta deterodon* and *Alasmidonta varicosa*) existing within the site area. Samples collected were last recorded in 1909. The PDNI recommends that a survey be done to update the status of clams and mussels possibly existing in the project area.

Birds - redbill hawk (one known in park area), grey horned owl, sparrow hawk, pheasant, woodcock, and waterfowl which are found seasonally such as mallard, wood duck, Canadian geese, and blue heron.

Mammals - raccoon, muskrat, rabbit, grey squirrel.

There are deer known to exist in the wooded areas near Interstate 95. Skunks are also believed to exist. Although shad migrate up the Delaware River to spawn in the late summer, they do not enter the Neshaminy Creek.

These listings should not be construed as complete. If further information is deemed necessary, on-site investigations by fish and wildlife experts would be required.

The development of a trail would offer Township residents a chance to enjoy and appreciate this wide variety of wildlife.

Care must be taken during construction activities not to cause silting or erosion problems which would interfere with the habitat.

H. Historic Preservation Impacts

An old house located at Totem Road and Bristol Pike (north side of Bristol Pike) is in good condition and possibly eligible for National Registry. According to the Pennsylvania Inventory, Bristol Pike is the oldest pike in Bucks County. The Pike was formerly an Indian path dating back to 1675.

The Pennsylvania Bureau of Historic Preservation and the Bucks County Conservancy both indicated there is potential for historic and pre-historic archeological findings within the site area. There is a known early ferry crossing at or near where Bristol Pike crosses the Neshaminy Creek. There may be an early ferry crossing near the Interstate 95 creek crossing also. The Bucks County Conservancy recommended hiring archeologists, as consultants, to investigate the site area prior to any construction. A list of archeologists who work in the Bucks County/Philadelphia area is available at the office of the Bucks County Conservancy.

I. Positive and Negative Factors of Trail Development

Site features, as described in the preceeding Site Inventory and Analysis sections, are listed below as being positive or negative factors for site development.

Positive Factors:

1. Privately owned vacant properties fall within the 100-year flood plain eliminating their capabilities for building construction. Most of the adjacent land uses, uses within the vicinity, and adjacent zoning are residential.
2. Numerous passive and active recreational activities are offered at Neshaminy State Park and Armstrong Park (when re-constructed). Neshaminy State Park has existing trails which would be extended by means of the proposed Neshaminy Creek trail. The State Park and Armstrong Park would be linked together.
3. Topography is predominantly level to gently sloping.
4. Flood plain is more suitable for recreational uses than other types of development.
5. There is a possibility of rare and unusual plant occurrence and a mixture of diverse vegetational cover and wetland communities. The trail could offer educational and intellectual experience and opportunity.
6. Hikers will have the opportunity to be close to and observe wildlife in a natural habitat.

Negative Factors:

1. The Township must acquire property or easements through 7 occupied and 14 vacant privately owned properties.
2. Some properties are extensively developed close to the Neshaminy Creek forcing the trail to follow roads. Safety factors must be considered. PennDOT permits must be secured. (See VII, Conclusions, for list of Permits)

3. Tributary creeks and swales must be crossed via existing roads or bridge, stormpipe, raised walkway on piles (permits required).
4. Soil surveys indicate high water table.
5. Wetlands mapped by the National Wildlife Inventory are general in nature and must be investigated on-site by the Army Corps of Engineers and DER to determine their significance. Final trail alignment will be dependent upon this survey.

IV. DEVELOPMENT REQUIREMENTS

A. General

An exciting aspect of the Neshaminy Creek Bike/Hike Trail is that it will ultimately link Neshaminy State Park with James Armstrong Memorial Park. The 2-3/4 mile length of trail will enhance the recreational uses offered at both parks. Bensalem Township has plans to reconstruct Armstrong Park. Development of Armstrong Park is of paramount importance to the success of the trail.

B. Parking Needs

There are existing parking lots at Neshaminy State Park and Armstrong Park, the two ends of the trail. There may be a need for parking and access within the interior portion of the trail. Urban Planning and Design Criteria recommends parking for a minimum of 25 autos at any access point for areas providing hiking for one day or less.

The Bucks County Estates open space, owned by Bensalem Township, would be a good location for parking and access. This is located just north of the I-95 bridge crossing. The open space area abuts Cliff Road (across from Jason Road) and has easy access to Newportville Road, a collector street. Since the Township owns the open space area, acquisition of easements will not be necessary. The ground is gently sloping. Soil types are mapped as Hatboro silt loam and Quarry. Hatboro silt loam is a typical flood plain soil, potentially subject to a high water table and periodic flooding. The Quarry mapping is

based on previous land uses and no limitations are listed by the soil survey. Enough of the open space land falls outside the flood plain and mapped wetland areas for construction of a parking lot. Thus, permits from the Army Corps of Engineers and DER would probably not be necessary. However, any activity impacting a wetland may require a permit. Corps of Engineers jurisdiction usually assesses impacts occurring up to 300 yds. from a wetland. An alternate parking area could be located at the Ashton Road paper street. The paper street (approved row which has not been constructed) extends from Dunston Road to the creek, just south of the I-95 bridge. At this location it would be necessary for the Township to abandon and acquire the paper street and a portion of tax parcel 2-78-28. The slope is gentle. The soil is mapped Hatboro silt loam and falls within both the 100-year flood plain and a mapped wetland area. Therefore, onsite investigations by the Army Corps of Engineers and DER would be required to determine if this area is worthy of preservation, and if wetland, floodplain, or erosion and sedimentation control permits are to be required.

C. Traffic Considerations

Vehicular access to and from the ends of the trail at Neshaminy State Park and Armstrong Park is good. Access to Armstrong Park is provided directly from Newportville Road, a collector street. Entrance to the State Park is provided from State Road, also an easily accessible collector street for Township residents.

Residents of the Coves, Bensalem Village, and Bucks County Estates will have easy pedestrian access to the trail through the open space of their developments. Most of the other Township residents using the trail will probably drive to one of the parking lots.

Safety for Township residents using the trail is of the utmost importance. The portion of the trail following Totem Road, a state right-of-way, when developed as a bikeway, will be subject to review and approval of the Pennsylvania Department of Transportation. This portion of the trail would be classified by PennDOT as a "Shared Roadway" - a roadway which is officially designated and marked as a bicycle route, but which is open to motor vehicle travel and upon which no bicycle lane is designated. According to PennDOT, existing roads usually do not have the room within the right-of-way for adding a separate bikeway. Therefore, existing roads are more likely to accommodate the type of bikeway that shares the roadway. A disadvantage of the Shared Roadway bikeway is the unidentified portion of the roadway for the bicyclist, therefore causing the bicycle to mix with the motor vehicles. If the volume and speed of the motor vehicles remain at a low level then the bikeway will be reasonably safe for bicyclists. PennDOT provides guidelines for proper signage and marking. Bikeways need to be properly signed, not only for identification, but to convey instruction to either bicyclists, motorists or both.

The Township must consider some manner of monitoring and patrolling the trail. This can be easily accomplished when the trail is on or near a roadway. In other areas, the police force, local bike clubs, and a resident watch force could be used to deal with this situation.

D. Property Ownership Considerations

It will be necessary for the Township to acquire rights-of-way through twenty-one (21) privately owned properties. This, of course, is dependent upon an in-field established trail alignment. Fourteen (14) of these parcels are vacant, and seven (7) are occupied - residential.

A Bucks County Water and Sewer Authority right-of-way traverses all of these properties. In some locations the right-of-way could also serve as the trail right-of-way. This could make construction easier and less expensive because the ground has already been cleared and the occurrence of rare plant materials and wetlands is not as probable as in undisturbed areas. We recommend that the Bensalem Township Board of Supervisors approach the Bucks County Water and Sewer Authority with this proposal.

E. Access to Waterfront

Access to the creek waterfront is presently available to the public at Neshaminy State Park and Armstrong Park. Both parks provide for fishing. Neshaminy State Park has a marina and public boat launch. Plans for Armstrong Park include a canoe

launch. Access to the waterfront at other places along the trail can be provided by aligning the trail near the creek at strategic points, and by providing secondary trails to the waterfront as shown on the Site Development Plans (see Plans; sheets 10,11,12; Appendix 1.)

F. Site Amenities

The implication of site amenities such as sitting benches, picnic tables, trash receptacles, and bike racks, may not be feasible within the 100-year flood plain. The Army Corps of Engineers and DER discourage such obstructions. The Urban Waterfront Action Group suggested not employing any of these items and keeping the trail natural. We recommend using these items at parking lot locations where people will be gathering.

V. SITE DESIGN

A. Trail Alignment

As was determined and explained in previous sections of this report, final trail alignment will be dependent upon intense on-site investigation. The Site Development Plans (see Plans; sheets 10,11,12; Appendix 1.) show a proposed approximate alignment. We recommend that this proposed alignment be staked in the field and then checked (onsite) by the proper agencies for its adequacy. Easements to be acquired shall have a width of 20 feet. Vacant properties which the trail traverses should be acquired in their entirety, if possible. Otherwise, right-of-way to be acquired shall have a width of twenty (20) feet. Twenty (20) feet is the typical right-of-way or easement width used by municipalities.

The proposed alignment follows the existing sanitary sewer easement at some locations. At other locations it shall be field adjusted to stay clear of existing natural features worthy of preservation. The proposed alignment (see Site Development Plans and Property Ownership Plans) will extend from James Armstrong Park as follows:

1. Leave Armstrong Park. Armstrong Park provides parking, site amenities, and access to the waterfront.
2. Cross parcels #2-84-29 and 2-84-28 (woods) (vacant properties) by way of the sanitary easement.
3. Follow east along Mill Creek, parcel #2-84-28, to Flushing Road and cross Mill Creek via the Flushing Road bridge.

4. Enter the Coves of Neshaminy open space (Township property) from Flushing Road. Distance traveled on Flushing Road equals approximately 150 L.F.
5. Cross the Coves of Neshaminy open space (grass, brush) near the creek edge. Access to waterfront provided.
6. Cross parcel #2-74-154 (brush and marsh) via the sanitary easement. This area has excellent aesthetic value - a wide variety of plant materials exists (vacant property).
7. Enter the open space owned by Bensalem Village. Go around property by way of 300 L.F. of boardwalk on the Creek itself. Thus, the trail will not interfere with Bensalem Village recreational activities. The boardwalk (proposed 8 feet wide) can be used by cyclists either riding or walking their bikes.
8. Enter Bucks County Estates open space (Township property) and cross by following an existing path (woods, brush). Secondary trail would extend to a proposed new parking area equipped with amenities.
9. Cross parcel #2-78-28.1 (woods, brush) by following an existing path (vacant properties).
10. Cross under I-95. Earthwork will be required.
11. Cross parcel #2-78-28 (woods) by following an existing path. Secondary trail will follow Ashton Road paper street to the creek for waterfront access (vacant property).

12. Follow sanitary easement across parcels #2-78-27, 2-78-26, 2-78-25, 2-78-24, 2-78-24, 2-78-22, 2-78-21, 2-77-92, 2-77-91, and Kleckner Road paper street (woods, vacant properties).
13. Cross parcels #2-77-51.2, 2-77-50, and 2-77-49 (woods, brush) by way of the sanitary easement (vacant properties).
14. Cross parcels #2-77-6.1, 2-77-5, and 2-77-4 (woods, brush) by way of the sanitary easement (occupied properties).
15. Follow Bridgewater Road for approximately 275 L.F. to Totem Road.
16. Follow Totem Road for the remainder of the trail to Neshaminy State Park. This will cross over State Road (possible hiking trail only could go under State Road - too steep for bicycles), cross under the railroad, and cross over State Road to the State Park. The trail could also extend across State Road to Bristol Township and connect with the proposed Bristol Township Trail.

B. Phasing

The Bensalem Township Parks and Recreation Board and the Urban Waterfront Action Group recommended construction of the trail strictly as a hiking trail first. The success/use of the hiking trail can be monitored prior to committing to the higher cost of bikeway construction. At a later time, depending upon the success and extent of use, the trail can be modified to handle

bicycles. This will entail coming back and installing a paved surface. Easements will have already been obtained and land will have been cleared.

The trail can be developed in three phases. Phase I will extend from Armstrong Park to the Bucks County Estates open space area. Phase I will have access, parking, and amenities at Armstrong Park. Phase I will span approximately 3/4 mile. Phase I should be constructed at the time when Armstrong Park is being reconstructed or after completion of Armstrong Park reconstruction. This is imperative for the trail to be successful.

Phase II will extend from the Bucks County Estates to Bridgewater Road. Construction of Phase II complete the portion of the trail following through natural terrain. Phase II will span approximately 1-1/4 miles.

Phase III will follow Bridgewater Road and Totem Road to Neshaminy State Park. Construction will consist of signage and pavement painting. Construction of a parking area with site amenities will be at the Bucks County Estates open space. Phase III will span approximately 3/4 mile.

C. Surface Types and Site Amenities

Details of trail surface types and site amenities can be found on the Site Development Plans (sheet 10; Appendix 3.) Construction of the trail as strictly a hiking trail would not require a paved surface. The trail must be cleared of brush.

A three (3) inch layer of wood chip mulch shall be applied to a trail width of a minimum of four (4) feet. Trails at Neshaminy State Park are of this construction. The State Park constructs and periodically maintains its trails with Boy Scout volunteer labor. The Township could pursue the same.

Paved bikeway surfaces shall be in accordance with PennDOT standards or standards recommended by the Army Corps of Engineers or DER following on-site investigations. A 1-1/2" thick bituminous surface shall be placed over a 5" thick aggregate sub-base to an average width of 10'. Material will be excavated so that the surface elevation will be at existing grade, thus not interfering with the flood plain or existing drainage patterns.

VI. PROJECT COSTS

A. Cost Estimate Summary

1. Land Acquisition

55 acres at average \$10,000.00 per acre = \$550,000.00

Assessment and legal fees not included.

2. Hike Trail Construction

Phase I

Clearing	\$10,000.00
Erosion and Sedimentation Control	4,000.00
*Hike Trail (4,350 L.F.)	4,000.00
Boardwalk (300 L.F.)	45,000.00
Restoration and Amenities (signs, pipe, etc.)	10,000.00
Miscellaneous and Contingencies	<u>7,300.00</u>
	\$80,300.00

Phase II

Clearing	\$12,000.00
Erosion and Sedimentation Control	5,000.00
*Hike Trail (6,000 L.F.)	5,000.00
Restoration and Amenities (signs, pipe, etc.)	12,000.00
Miscellaneous and Contingencies	<u>3,400.00</u>
	\$37,400.00

Phase III

Clearing	\$ 2,000.00
Erosion and Sedimentation Control	3,000.00
*Hike Trail (under Bristol Pike)	1,500.00
Restoration and Amenities (signs, painted barriers, six [6] picnic tables)	10,000.00
Parking Lot (at Bucks County Estates)	17,000.00
Miscellaneous and Contingencies (10%)	<u>3,350.00</u>
	\$36,850.00

3. Bikeway Construction

Earthwork	\$ 6,000.00
Bikeway Paving (10,350 L.F.)	92,000.00
Erosion and Sedimentation Control	5,000.00
Restoration and Amenities (signs, pipe, etc.)	10,000.00
Miscellaneous and Contingencies (10%)	<u>11,300.00</u>
	\$124,300.00

Construction costs based on contracting prices. Some work, such as clearing and hike trail construction could be done by the Township. Volunteer work, such as Boy Scouts, could be applicable.

4. Consultants

Final engineering, surveying, archeological investigation, inspection - 15% of construction costs	\$ 41,827.50
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5. Totals

a. Land Acquisition (assessment and legal fees not included)	\$550,000.00
b. Hike Trail - Phase I	80,300.00
c. Hike Trail - Phase II	37,400.00
d. Hike Trail - Phase III	36,850.00
e. Bikeway Construction	124,300.00
f. Consultants	<u>41,827.50</u>
Total	\$870,677.50

*Assume wood chips to be acquired free of charge.

B. Financing Alternatives

Program funding applicable to the implementation of the Neshaminy Creek Bike/Hike Trail may be available from the following sources:

Federal

U.S. Department of the Interior, National Park Service,
Urban Park and Recreation Recovery Program.

National Park Service, Northeast Regional Office
Federal Office Building, Room 9310
600 Arch Street
Philadelphia, PA 19106
Attention: William J. Greer

U.S. Department of the Interior National Park Service, Land
and Water Conservation Fund Grants

National Park Service
Department of the Interior
Washington, DC 20240
Attention: Sam L. Hall

Soil Conservation Service

Department of Agriculture
Deputy Chief for Natural Resources Projects,
Soil Conservation Service
P. O. Box 2890
Washington, DC 20013

Department of Housing and Urban Development
Community Planning Development

HUD
Small Cities Division
Office of Block Grant Assistance,
Community Planning and Development
451 - 7th Street, S.W.
Washington, DC 20410

-also-

Office of Urban Development Action Grants
451 - 7th Street, S.W.
Washington, D.C. 20410

State

Pennsylvania Department of Community Affairs
Recreation and Conservation Assistance

908 State Office Building
Broad and Spring Garden Streets
Philadelphia, PA 19130
Attention: Alan Sacks

Pennsylvania Department of Community Affairs
Coastal Energy Impact Program

908 State Office Building
Broad and Spring Garden Streets
Philadelphia, PA 19130
Attention: Alan Sacks

Pennsylvania Department of Community Affairs
Small Communities Program

908 State Office Building
Broad and Spring Garden Streets
Philadelphia, PA 19130
Attention: Alan Sacks

Pennsylvania Department of Environmental Resources
Coastal Zone Management Program

Division of Coastal Zone Management
Bureau of Water Resources Management
Department of Environmental Resources
P. O. Box 1467
Harrisburg, PA 17120

*will be requesting "Letters of Interest" for
fiscal year 1984 in early 1984.

Local/Private

The Grundy Foundation
P. O. Box 701
Bristol, PA 19007

VII. CONCLUSIONS

A. Statement of Feasibility

Prior to construction of the trail, there are several matters to be resolved. Bensalem Township must secure permits from the proper regulatory agencies. Final trail alignment must be determined in the field upon performance of on-site investigations. Another matter of Township concern for project feasibility is available funding.

Complete construction of the Bike/Hike Trail will provide opportunity for pleasurable recreational experiences. Bicycling, hiking, picnicking, enjoying nature, and cross-country skiing are some of the activities that can be enjoyed throughout the year.

B. Schedule

Steps to be taken by Bensalem Township to work towards construction of the trail are listed by priority.

1. Apply for project funding.
2. Stake-out preliminary trail alignment in-field.
3. Coordinate on-site investigations
 - . Department of Environmental Resources
 - . Army Corps of Engineers
 - . PA Natural Diversity Inventory
 - . Historic and Pre-historic Archeologists
4. Acquire properties and rights-of-way

5. Apply for permits

- . Department of Environmental Resources
Bureau of Dams and Waterway Management -
Dam or Waterway Obstruction Permit.
- . Department of Environmental Resources
Bureau of Soil and Water Conservation
(if earth disturbance greater than 25 acres in one
construction phase)
- . U.S. Army Corps of Engineers - 404 Permit
- . Bucks County Conservation District
- . U.S. Coast Guard (if required for boardwalk con-
struction)
- . Pennsylvania Department of Transportation -
Occupancy Permit

6. Develop final engineering plans and construction schedule.

VIII. Literature Consulted

Anatomy of a Park, Albert J. Rutledge, ASLA; 1971

Bensalem Township Comprehensive Plan; January 1975

Commonwealth of Pennsylvania Coastal Zone Management and Final Environmental Impact Statement, U.S. Department of Commerce and others; August 1980.

Facilities Planning, Bensalem Township Park and Recreation Plan; July 1976

"Flood Insurance Rate Map", Township of Bensalem; U.S. Department of Housing and Urban Development; July 1978.

Guidelines for the Development of Bikeways, Pennsylvania Department of Transportation; June 1977

Handbook of Landscape Architectural Construction, the Landscape Architectural Foundation; 1976

Master Plan Study - James Armstrong Memorial Park, Carroll Engineering Corporation; 1981

"National Wetlands Inventory Map", U.S. Department of the Interior Fish and Wildlife Service; 1977

Recreation, Parks and Open Space Plan, Bensalem Township, Bucks County, Pennsylvania; December 1976.

Soil Survey of Bucks and Philadelphia Counties, United States Department of Agriculture, Soil Conservation Service; July 1975

Subdivision and Land Development Regulations, Section 721, Bicycle Paths, New Britain Township, Bucks County, PA; June 1976.

Urban Planning and Design Criteria, Second Edition, Joseph DeChiara, Lee Koppelman; 1975

APPENDIX 1

Properties

Tax Map Parcel Numbers and Property Owners*

#2-84-30-1	Bensalem Township - James Armstrong Memorial Park
#2-84-29	Lewis, Raymond
#2-84-28	Lewis, Caroline
#2-84-27	Martin, Rodie E. & Elaine
#2-84-238	Bensalem Township open space
#2-74-154	Rybel, Sugmund & Irene
#2-94-558	Midlantic National Bank, N.A.
#2-78-46-2	Bensalem Township open space
#2-78-28.1	Leister, Howard I. & Edith
#2-78-28	" " "
#2-78-21	" " "
#2-78-22	" " "
#2-78-23	" " "
#2-78-24	" " "
#2-78-25	" " "
#2-78-26	" " "
#2-78-27	" " "
#2-77-92	" " "
#2-77-91	Coates, William E. & Elsie
#2-77-51.2	Leister, Howard I. & Edith
#2-77-50	Morris, John & Patricia
#2-77-49	Morris, John & Patricia
#2-77-6.1	Tryon, Marguerite & Veronica
#2-77-5	Aston, Raymond & Bonnie
#2-77-4	Scarborough, Robert & Marie

#2-77-3	Price, Chrisiana
#2-77-2	Lyons, Jack & Ramona Jean
#2-76-92	Lyons, Jack & Ramona
#2-76-139	Hackert, Geo. J. & Mabel D.
#2-76-138	Brodecki, Edward J., Jr. & He
#2-76-137	RR PA Co.
#2-76-137-1	Continental Elec., Inc.
#2-76-136	Continental Elec., Inc.
#2-76-135	Kronebitter, Leroy W. & Rita
#2-76-134	Hoff, Joseph F. & Anne Y.
#2-76-133	Fisher, Eleanor C. et al
#2-76-132	Schulz, Ronald A. & Lovell
#2-76-131	Soley, Edward J. & Laura
#2-76-130	Brenner, Beverly
#2-76-129	Litz, John G. & Agnes C.
#2-76-128	Kuntz, Dorothy M.
#2-76-127	Colantuono, Carl G. & Cathe
#2-80-10	Belardino, Irene H.
#2-80-14	VanSciver, John Curtis, Hepker, C.F., & Floge, L.F.
#2-80-15	McClurkin, Raymond W. et ux
#2-80-16	Sullivan, Elizabeth E.
#2-80-17	Wohlgemuth, Frederick G.
#2-80-18	Wohlgemuth, Frederick & GE
#2-80-19	Devlin, Wm. A., Jr. & Loretta
#2-80-20	Wharfe, Harry et al
#2-80-21	Hackert, George J. & Mabel

#2-80-22	Svoronos, George & Judith
#2-80-23	Holzer, Meta H. & Dianne R.
#2-80-24	Zilka, Clement, Jr.
#2-80-25	Schaum, Charles B. & Theodo
#2-80-26	Schaum, Theodore T. et al
#2-80-27	Diegidio, Joseph & Louis
#2-80-29	Lauff, Julius
#2-80-29-1	Lauff, Julius
#2-80-33	Diegidio, Joseph & Louis

*The properties in the project area are listed as they occur following along the Neshaminy Creek from James Armstrong Memorial Park south to Neshaminy State Park. (see Property Ownership Plans, Appendix 3, sheets 4, 5, and 6.)

Privately Owned Properties the Trail will Traverse
(According to Proposed Alignment)

Tax Parcel #2-84-29	occupied
#2-84-28	vacant
#2-74-154	vacant
#2-94-558	occupied (open space)
#2-78-28.1	vacant
#2-78-28	vacant
#2-78-21	vacant
#2-78-22	vacant
#2-78-23	vacant
#2-78-24	vacant
#2-78-25	vacant
#2-78-26	vacant
#2-78-27	vacant
#2-77-92	vacant
#2-77-91	vacant
#2-77-51	vacant
#2-77-50	occupied
#2-77-49	occupied
#2-77-6.1	occupied
#2-77-5	occupied
#2-77-4	occupied

Total area of vacant property to be acquired is approximately 55 acres. These parcels are to be acquired in their entirety. Total linear feet of 20' wide right-of-way traversing occupied properties is approximately 1,200 feet.

APPENDIX 2
Correspondence

Pennsylvania Natural Diversity Inventory

1218 CHESTNUT STREET
SUITE 505
PHILADELPHIA, PA 19107
215-592-8610

Deirdre C. Taylor
Division of Coastal Zone Management, DER
P.O. BOX 1467
Harrisburg, PA 17120

Dear Deirdre:

As per your written request I have enclosed a copy of the Bristol quadrangle indicating the location of Bristol Marsh and the rare plant and community occurrences we have for the site.

I have also indicated on the maps you provided the rare plant records we have for the Neshaminy Creek area. These occurrences are Sagittaria subulata, Sagittaria calycina, Zizania aquatica, Amaranthus cannabinus, Isoetes riparia, and Bidens bidentoides plus a Freshwater Intertidal Mudflat Community.

We also have rare plant and animal occurrences for several of the other areas you outlined. However due to time limitations I have not included all this information. We will be moving our office to a Bureau of Forestry office in Middletown on the 28 of September. Hopefully we can arrange a meeting with you and other interested staff in your office shortly after this date so that you can see what information we have to offer and how it is managed.

Our new office address will be:
PA Natural Diversity Inventory
Bureau of Forestry, DER
P.O. BOX 1467
Harrisburg, PA 17120

and we will be located in the Forest Pest Lab in Middletown at 34 Airport Drive, no phone number to date.

Sincerely,

Thomas L. Smith

Thomas L. Smith, Coordinator/Plant Ecologist
PNDI

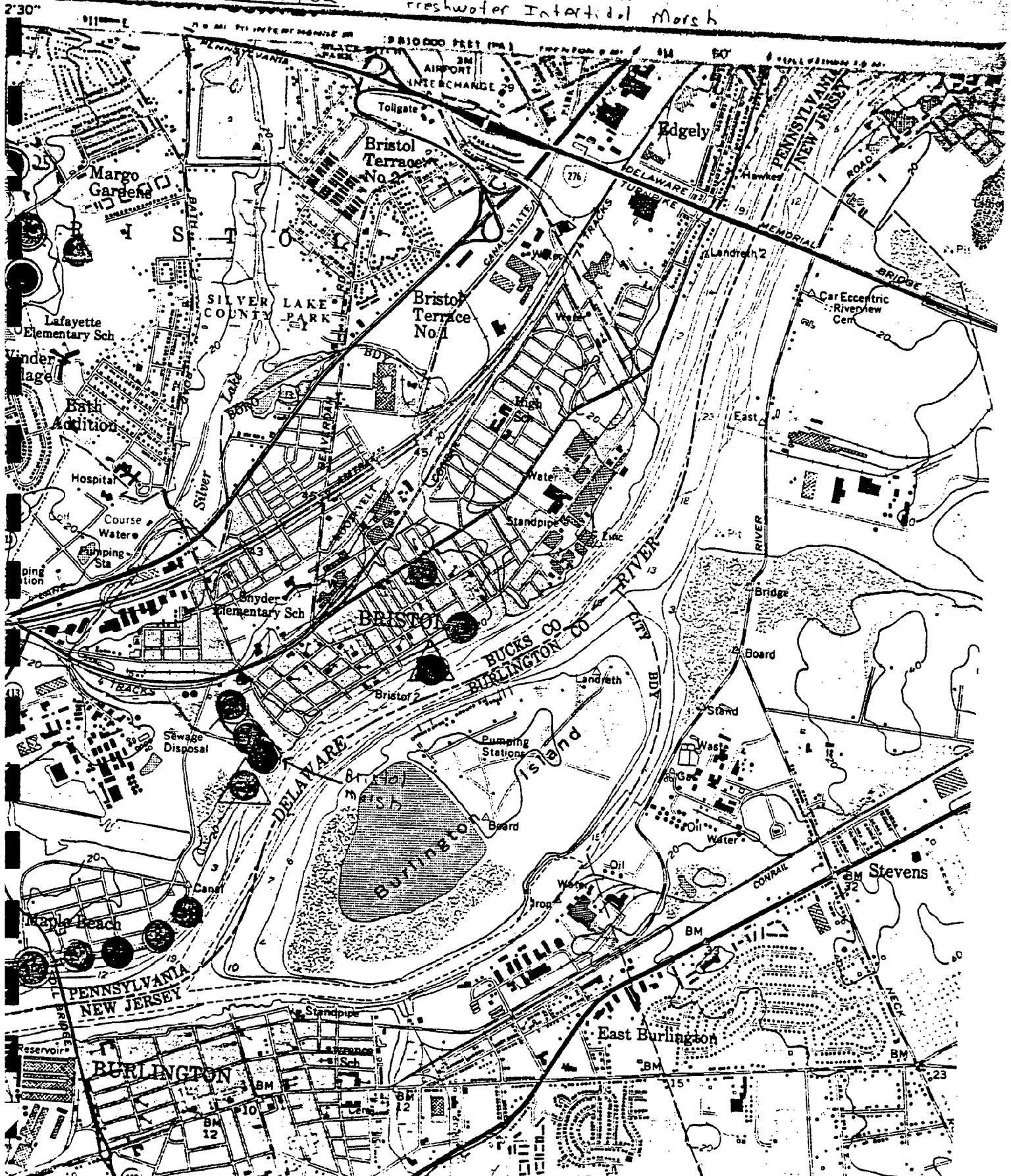
copy to Dan Mullin from Dee Taylor



Sagittaria arifolia PE
Sagittaria subulata PE
Echinochloa walteri PR
Bidens bitontoides PE/C2

Zizania aquatica PR
Amoranthus canescens PR
Careopsis rosea PR
 Freshwater Intertidal Marsh

Bristol Quad



Pennsylvania Natural Diversity Inventory

1218 CHESTNUT STREET
SUITE 505
PHILADELPHIA, PA 19107
215-592-8610

Daniel P. Mullin
Carroll Engineering Corporation
901 Woodbine Ave,
Bensalem, PA 19020

Dear Mr. Mullin:

In response to your data request on the west shore of Neshaminy Creek, we are providing the following information. As indicated on the enclosed map we have historical records for Alasmodonta heterodon and Alasmodonta varicosa. These were collected in 1909 and to our knowledge no survey has been done since to reverify these records. We would advise you to contact the Fish and Wildlife Service as the status of Alasmodonta heterodon as we believe it is under consideration for federal listing; a survey of the mussels would also be recommended. If such a survey is conducted we would very much appreciate being advised of your findings.

We have no rare plant occurrences for the outlined project area. However, directly downstream in the intertidal zone we have 1982 records for Sagittaria calycina and Sagittaria subulata both being proposed for State Endangered status. 1982 field surveys also verified the existence of Zizania aquatica (proposed state rare), Bidens bidentoides (Federal C2, proposed state endangered), Amaranthus cannabinus (proposed state rare), Isoetes riparia (proposed state endangered), and a Freshwater Intertidal Mudflat community. Heavy silt from upstream disturbance would affect all these occurrences.

Please note that while this information is available for preparation and review of environmental assessments, it is not a substitute for on-site surveys. The quantity and quality of data collected by the PNDI are dependent on the research and observations of many individuals and organizations. In most cases, information on environmental elements is not the result of comprehensive field surveys. For this reason the PNDI cannot provide a definitive statement on the presence, absence, or degree of health of environmental elements in any part of the state. We welcome coordination with individuals or organizations proposing environmental alteration. However, the information, or lack thereof, should never be regarded as a complete statement on the elements being considered.

If you have further questions please feel free to contact me.

Sincerely,

Thomas L. Smith

Thomas L. Smith, Coordinator/Plant Ecologist
PNDI



NESHAMINTY CREEK WEST SIDE SHORE LINE

7.5 MINUTE SERIES (TOPOGRAPHIC)

SW/4 BURLINGTON 15' QUADRANGLE

606°
(TRENTON)

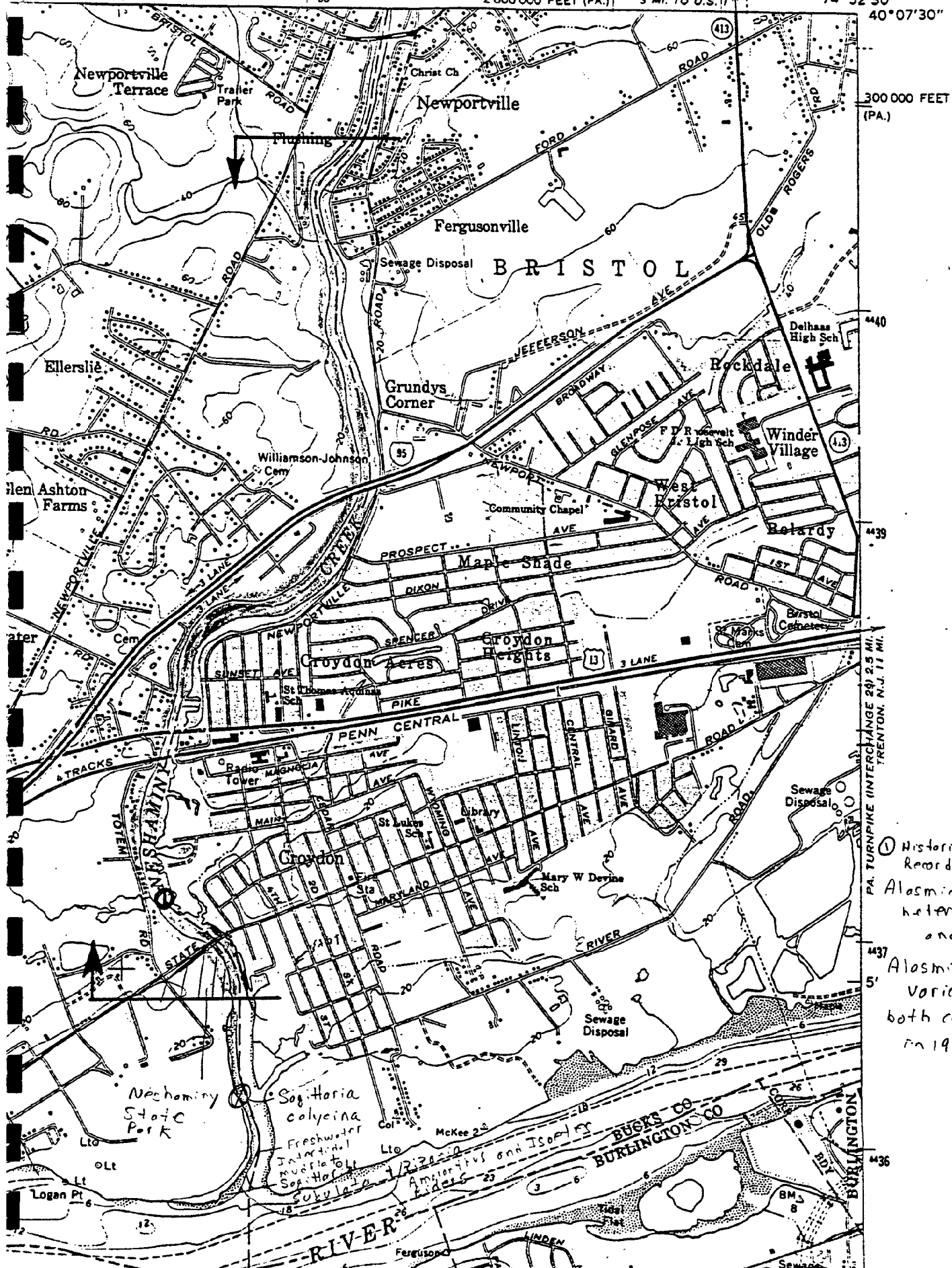
307 55'

308

2 800 000 FEET (PA.)

3 MI. TO U.S.

74°52'30"
40°07'30"



① Historic
Records
Alasmodonta
heterodon
and
Alasmodonta?
varicosa
both collected
in 1909

PENNSYLVANIA PLANTS OF SPECIAL CONCERN
Prepared by the Rare Plant Committee of the
Pennsylvania Native Plant Society
February 1983

<u>Element Name</u>	<u>Common Name</u>	<u>Status Fed./St.</u>
<i>Aconitum reclinatum</i> Gray	White Monkshood	N /PE
<i>Aconitum uncinatum</i> L.	Blue Monkshood	N /PR
<i>Aeschynomene virginica</i> (L.) BSP	Sensitive Joint-Vetch	C2/PX
<i>Agalinis fasciculata</i> (Ell.) Raf. [<i>Gerardia fasciculata</i> Ell.]	Fascicled False-Foxglove	N /PX
<i>Agalinis obtusifolia</i> Raf. [<i>Gerardia obtusifolia</i> (Raf.) Pennell.]	False-Foxglove	N /PR
<i>Agalinis purpurea</i> (L.) Pennell var. <i>parviflora</i> (Benth.) Boivin [<i>Gerardia purpurea</i> L. var. <i>parviflora</i> Benth.]	Large Purple False-Foxglove	N /PR
<i>Agrostis altissima</i> (Walt.) Tuckerm. [<i>Agrostis perennans</i> (Walt.) Tuckerm. var. <i>elata</i> (Pursh) Hitchc.]	Tall Bentgrass	N /TU
<i>Alnus viridis</i> (Chaix) DC spp. <i>crispa</i> (Ait.) Turrell [<i>Alnus crispa</i> (Ait.) Pursh]	Mountain Alder	N /TU
<i>Alopecurus carolinianus</i> Walt.	Tufted Foxtail	N /TU
→ <i>Amaranthus cannabinus</i> (L.) Sauer.	Waterhemp Ragweed	N /PR
<i>Amelanchier bartramiana</i> (Tausch) Roemer.	Oblong-Fruited Serviceberry	N /PT
<i>Ammannia coccinea</i> Rottb.	Scarlet Ammannia	N /PR
<i>Ammophila breviligulata</i> Fern.	American Beachgrass	N /PR
<i>Anemone cylindrica</i> Gray	Long-Fruited Anemone	N /PR
<i>Anemone riparia</i> Fern.	Anemone	N /TU
<i>Antennaria neglecta</i> Greene var. <i>attenuata</i> (Fern.) Cronq.	Field Pussy-Toes	N /PR
<i>Antennaria solitaria</i> Rydb.	Single-Headed Pussy-Toes	N /PR
<i>Aplectrum hyemale</i> (Muhl. ex. Willd.) Nutt.	Puttyroot	N /PR
<i>Arabis missouriensis</i> Greene [NOT recognized by Gleason]	Missouri Rock-Cress	N /PR
<i>Arctostaphylos uva-ursi</i> (L.) Spreng.	Bearberry Manzanita	N /PT
<i>Arethusa bulbosa</i> L.	Swamp-Pink	N /PV
<i>Arnica acualis</i> (Walt.) BSP	Leopard's-Bane	N /PT
<i>Asclepias rubra</i> L.	Red Milkweed	N /PR
<i>Asplenium bradleyi</i> D.C. Eat.	Bradley's Spleenwort	N /PR
<i>Asplenium resiliens</i> Kunze	Black-Stemmed Spleenwort	N /PX
<i>Aster depauperatus</i> (Porter) Fern.	Serpentine Aster	C2/PE
<i>Aster ericoides</i> L.	White Heath Aster	N /PR
<i>Aster spectabilis</i> Ait.	Low Showy Aster	N /PR
<i>Astragalus neglectus</i> (T. & G.) Shield	Cooper's Milk-Vetch	N /PR
<i>Baccharis halimifolia</i> L.	Eastern Baccharis	N /PR
<i>Berberis canadensis</i> Mill.	American Barberry	N /PX
→ <i>Bidens bidentoides</i> (Nutt.) Britt.	Swamp Beggar-Ticks	C2/PE
<i>Boltonia asteroides</i> (L.) L'Her.	Aster-Like Boltonia	N /PR
<i>Cakile edentula</i> (Bigel.) Hook	American Sea-Rocket	N /PR
<i>Camassia scilloides</i> (Raf.) Gray	Wild Hyacinth	N /PR
<i>Carex adusta</i> Boott.	Sedge	N /PR
<i>Carex aenea</i> Fern.	Fernald's Hay Sedge	N /PR

<u>Element Name</u>	<u>Common Name</u>	<u>Status:</u> <u>Fed./St.</u>
<i>Carex alopecoidea</i> Tuckerm.	Foxtail Sedge	N /PR
<i>Carex aquatilis</i> Wabl.	Water Sedge	N /PR
<i>Carex atherodes</i> Spreng.	Awed Sedge	N /PR
<i>Carex aurea</i> Nutt.	Golden-Fruited Sedge	N /PR
<i>Carex backii</i> Boott.	Rocky Mountain Sedge	N /PR
<i>Carex barrattii</i> Schw. & Torr.	Barratt's Sedge	N /PX
<i>Carex bebbii</i> (Bailey) Fern.	Bebb's Sedge	N /PR
[<i>Carex bebbii</i> Olney]		
<i>Carex bicknellii</i> Britt.	Bicknell's Sedge	N /PR
<i>Carex bullata</i> Schk.	Sedge	N /PR
<i>Carex careyana</i> Dewey	Carey's Sedge	N /PR
[<i>Carex careyana</i> Torr.]		
<i>Carex cephalantha</i> (Bailey) Bickn.	Lesser Prickly Sedge	N /PR
[<i>Carex muricata</i> L. var. <i>laricina</i> (Mackenzie) Gl.]		
<i>Carex chordorrhiza</i> Ehrh. ex. L.f.	Creeping Sedge	N /PR
[<i>Carex chordorrhiza</i> L.f.]		
<i>Carex collinsii</i> Nutt.	Collin's Sedge	N /PT
<i>Carex crawfordii</i> Fern.	Crawford's Sedge	N /PR
<i>Carex cumulata</i> (Bailey) Fern.	Clustered Sedge	N /PR
[<i>Carex cumulata</i> (Bailey) Mackenzie]		
<i>Carex diandra</i> Schrank	Lesser Panicle Sedge	N /PR
<i>Carex eburnea</i> Boott.	Ebony Sedge	N /PR
<i>Carex formosa</i> Dewey	Sedge	N /PR
<i>Carex garberi</i> Fern.	Elk Sedge	N /PR
<i>Carex geyeri</i> Boott.	Geyer's Sedge	N /PT
<i>Carex nigra</i> (L.) Reich.	Black Sedge	N /PX
<i>Carex oligosperma</i> Michx.	Few-Seeded Sedge	N /PR
<i>Carex pseudocyperus</i> L.	Cyperus-Like Sedge	N /PR
[<i>Carex pseudo-cyperus</i> L.)		
<i>Carex sartwellii</i> Dewey	Sartwell's Sedge	N /PT
<i>Carex schweinitzii</i> Dewey ex. Schwein	Schweinitz's Sedge	N /PR
[<i>Carex schweinitzii</i> Dewey]		
<i>Carex tetanica</i> Schk.	Wood's Sedge	N /PR
<i>Carex viridula</i> Michx.	Green Sedge	N /PR
<i>Carex wiegandii</i> Mackenzie	Sedge	N /PT
<i>Castanea pumila</i> (L.) Mill.	Allegheny Chinkapin	N /PR
<i>Cerastium arvense</i> (L.) var. <i>villosissimum</i> Penn.	Mouse-Ear Chickweed	C2/PT
<i>Chamaecyparis thyoides</i> (L.) BSP	Atlantic White Cedar	N /PX
<i>Chasmanthium laxum</i> (L.) Yates	Slender Sea-Oats	N /PR
[<i>Uniola laxa</i> (L.) BSP]		
<i>Chenopodium foggii</i> Wabl.	Goosefoot	N /PR
<i>Chrysogonum virginianum</i> L.	Green-and-Gold	N /PR
<i>Cirsium horridulum</i> Michx.	Thistle	N /PR
<i>Clematis viorna</i> L.	Vase-Vine Leather-Flower	N /PR
<i>Clethra acuminata</i> Michx.	Mountain Pepper-Bush	N /PR
<i>Commelina erecta</i> L.	Slender Day-Flower	N /PR
<i>Commelina virginica</i> L.	Virginia Day-Flower	N /PR
<i>Coreopsis rosea</i> Nutt.	Pink Tickseed	N /PR
<i>Crassula aquatica</i> (L.) Scheonl.	Water Pigmy-Weed	N /PE
[<i>Tillaea aquatica</i> L.]		

<u>Element Name</u>	<u>Common Name</u>	<u>Status: Fed./St.</u>
<i>Crotonopsis elliptica</i> Willd.	Elliptical Rushfoil	N /PR
<i>Cryptogramma stelleri</i> (Gmel.) Prantl.	Slender Rock-Brake	N /PE
<i>Cuscuta coryli</i> Engelm.	Hazel Dodder	N /PR
[<i>Cuscuta coryli</i> Engelm.]		
<i>Cuscuta pentagona</i> Engelm.	Field Dodder	N /PR
<i>Cuscuta polygonorum</i> Engelm.	Smartweed Dodder	N /PR
<i>Cymophyllus fraseri</i> (Andr.)	Fraser's Sedge	N /PR
<i>Cynanchum laeve</i> (Michx.) Pers.	Smooth Swallow-Wort	N /PR
<i>Cyperus diandrus</i> Torr.	Umbrella Flatsedge	N /PR
<i>Cyperus engelmanni</i> Steud.	Engelmann's Flatsedge	N /PR
<i>Cyperus filicinus</i> Vahl.	Flatsedge	N /PR
<i>Cyperus globulosus</i> Aubl.	Baldwin's Flatsedge	N /PR
<i>Cyperus houghtonii</i> Torr.	Houghton's Flatsedge	N /PR
<i>Cyperus polystachyos</i> Roth.	Many-Spiked Flatsedge	N /PR
<i>Cyperus refractus</i> Engelm. ex. Steud	Reflexed Flatsedge	N /PR
[<i>Cyperus refractus</i> Engelm.]		
<i>Cyperus retrorus</i> Chapm.	Retorse Flatsedge	N /PR
<i>Cyperus tenuifolius</i> (Sted.) Dandy	Thin-Leaved Flatsedge	N /PR
<i>Cypripedium candidum</i> Muhl. ex. Willd.	Small White Lady's-Slipper	N /PX
[<i>Cypripedium candidum</i> Muhl.]		
<i>Cypripedium parviflorum</i> Salisb.	Small Yellow Lady's-Slipper	N /PV
[<i>Cypripedium calceolus</i> L. var. <i>pubescens</i> (Willd.) Correll.]		
<i>Cypripedium reginae</i> Walt.	Showy Lady's-Slipper	N /PV
<i>Delphinium exaltatum</i> Ait.	Tall Larkspur	N /PR
<i>Desmodium sessilifolium</i> (Torr.) T. & G.	Sessile-Leaved Tick-Trefoil	N /PR
<i>Diarrhena americana</i> var. <i>americana</i>	American Beakgrass	N /PR
<i>Dicentra eximia</i> (Ker. -Gwal) Torr.	Wild Bleeding-Hearts	N /PR
[<i>Dicentra eximia</i> (Ker.) Torr.]		
<i>Dichanthelium acuminatum</i> var. <i>densiflorum</i> (Rand. & Reaf.) Gould & Clark	Dichanthelium	N /PR
[<i>Panicum spretum</i> Schult.]		
<i>Dichanthelium boreale</i> (Nash) Freckman	Dichanthelium	N /PR
[<i>Panicum bicknellii</i> Nash]		
<i>Dichanthelium commutatum</i> (Schultes) Gould	Dichanthelium	N /PR
[<i>Panicum commutatum</i> Schult.]		
<i>Dichanthelium leibergii</i> (Vasey) Freckmann	Dichanthelium	N /PT
[<i>Panicum leibergii</i> (Vasey) Scribn.]		
<i>Dichanthelium scoparium</i> (Lam.) Gould	Dichanthelium	N /PR
[<i>Panicum scoparium</i> Lam.]		
<i>Dichanthelium xanthophysum</i> (Gray) Freckmann	Dichanthelium	N /PR
[<i>Panicum xanthophysum</i> Gray]		
<i>Digitaria cognatum</i> (Schultes) Pilger	Fall Witch-Grass	N /PR
[<i>Leptoloma cognatum</i> (Schulte.) Chase]		
<i>Distichlis spicata</i> (L.) Greene	Sea-Shore Salt-Grass	N /PR
<i>Dodecatheon meadia</i> L.	Common Shooting-Star	N /PV

<u>Element Name</u>	<u>Common Name</u>	<u>Status:</u> <u>Fed./St.</u>
<i>Draba reptans</i> (Lam.) Fern.	Carolina Whitlow-Grass	N /PR
<i>Echinochloa walteri</i> (Pursh) Heller	Walter's Barnyard-Grass	N /PR
[<i>Echinochloa walteri</i> (Pursh) Nash]		
<i>Elatine americana</i> (Pursh) Arn.	Long-Stemmed Water-Wort	N /PX
[<i>Elatine triandra</i> var. <i>americana</i> (Pursh) Fassett]		
<i>Eleocharis intermedia</i> Schultes	Matted Spike-Rush	N /PR
[<i>Eleocharis intermedia</i> (Mulh.) Schult.]		
<i>Eleocharis obtusa</i> (Willd.) Schultes	Wright's Spike-Rush	N /PR
var. <i>obtusa</i>		
SY = <i>Eleocharis diandra</i> Wright		
SY = <i>Eleocharis obtusa</i> var. <i>peasei</i>		
<i>Eleocharis quadrangulata</i> (Michx.) R.&S.	Four-Angled Spike-Rush	N /PR
<i>Eleocharis robbinsii</i> Oakes	Robbins' Spike-Rush	N /PR
<i>Eleocharis rostellata</i> (Torr.) Torr.	Beaked Spike-Rush	N /PT
[<i>Eleocharis rostellata</i> Torr.]		
<i>Eleocharis tricostrata</i> Torr.	Three-Ribbed Spike-Rush	N /PR
<i>Eleocharis tuberculosa</i> (Michx.) R.&S.	Long-Tubercled Spike-Rush	N /PR
<i>Elodea schweinitzii</i> (Planch.)	Schweinitz's Waterweed	C2/PX
<i>Equisetum variegatum</i> Schleich.	Variegated Horsetail	N /PR
ex. Weber & C. Mohr.		
[<i>Equisetum variegatum</i> Schleich.]		
<i>Erianthus giganteus</i> (Walt.) Muhl.	Sugar Cane Plumegrass	N /PR
<i>Eriocaulon decangulare</i> L.	Pipewort	N /PR
<i>Eriocaulon parkeri</i> Robins.	Parker's Pipewort	N /PX
<i>Eriophorum tenellum</i> Nutt.	Rough Cotton-Grass	N /PR
<i>Eryngium aquaticum</i> L.	Marsh Eryngo	N /PR
<i>Eupatorium leucolepis</i> (DC) T. & G.	White-Bracted Thoroughwort	N /PR
<i>Euphorbia ipecacuanhae</i> L.	Wild Ipecac	N /PT
<i>Euphorbia obtusata</i> Pursh.	Blunt-Leaved Spurge	N /PR
<i>Euphorbia purpurea</i> (Raf.) Fern.	Glade Spurge	C2/PT
<i>Festuca paradoxa</i> Desv.	Cluster Fescue	N /PR
<i>Fimbristylis annua</i> (all.)	Annual Fimbry	N /PT
Roemer & Schultes		
<i>Fimbristylis castanea</i> (Michx.) Vahl.	Marsh Fimbry	N /PR
<i>Fimbristylis puberula</i> (Michx.) Vahl.	Marsh Fimbry	N /PR
<i>Frasera caroliniensis</i> Walt.	American Columbo	N /PR
[<i>Swertia caroliniensis</i> (Walt.) Kuntze.]		
<i>Froelichia floridana</i> (Nutt.) Moq.	Florida Cotton-Weed	N /PR
<i>Galactia regularis</i> (L.) BSP	Eastern Milk-Pea	N /PR
<i>Galactia volubis</i> (L.) Britt.	Downey Milk-Pea	N /PR

<u>Element Name</u>	<u>Common Name</u>	<u>Status:</u> <u>Fed./St.</u>
<i>Galearis spectabilis</i> (L.) Raf. [<i>Orchis spectabilis</i> L.]	Showy Orchid	N /PV
<i>Galium labradoricum</i> (Wieg.) Wieg.	Labrador Marsh Bedstraw	N /PR
<i>Gaultheria hispidula</i> (L.) Muhl. ex. Bigelow [<i>Gaultheria hispidula</i> (L.) Muhl.]	Creeping Snowberry	N /PR
<i>Gaylussacia brachycera</i> (Michx.) Gray	Box Huckleberry	N /PR
<i>Gaylussacia dumosa</i> (Andr.) T.&G.	Dwarf Huckleberry	N /PR
<i>Gentiana catesbaei</i> Walt.	Elliott's Gentian	N /PR
<i>Glyceria obtusa</i> (Muhl.) Trin.	Blunt Manna-Grass	N /PR
<i>Goodyera tessellata</i> Lodd.	Checkered Rattlesnake-Plantain	N /PV
<i>Gymnocarpium robertianum</i> (Hoff.) Newm.	Limestone Oak Fern	N /PT
<i>Gymnopogon ambiguus</i> (Michx.) BSP	Broad-Leaved Beardgrass	N /PR
<i>Hedyotis purpurea</i> (L.) Torr. & Gray	Purple Bluet	N /PR
<i>Helianthus angustifolius</i> L.	Swamp Sunflower	N /PR
<i>Hemicarpha micrantha</i> (Vahl.) Britt.	Common Hemicarpa	N /PR
<i>Hibiscus laevis</i> All. [<i>Hibiscus militaris</i> Cov.]	Hibiscus	N /PR
<i>Hierochloa odorata</i> (L.) Beauv.	Vanilla Sweet-Grass	N /PR
<i>Hordeum pusillum</i> Nutt.	Little Barley	N /PR
<i>Hottonia inflata</i> Ell.	American Featherfoil	N /PR
<i>Hydrastis canadensis</i> L.	Golden-Seal	N /PV
<i>Hypericum adpressum</i> Bart.	Creeping St. John's Wort	N /PR
<i>Hypericum denticulatum</i> Walt.	Coppery St. John's-Wort	N /PR
<i>Hypericum gymnanthum</i> Engelm. & Gray	Clasping-Leaved St. John's Wort	N /PR
<i>Hypericum majus</i> (Gray) Britt.	Larger Canadian St. John's Wort	N /PR
<i>Hypericum stans</i> (Michx.) P. Adams & Robson [<i>Ascyrum stans</i> Michx.]	St. Peter's-Wort	N /PX
<i>Ilex glabra</i> (L.) Gray	Ink-Berry	N /PX
<i>Iodanthus pinnatifidus</i> (Michx.) Steud	Purple Rocket	N /PR
<i>Iris cristata</i> Soland [<i>Iris cristata</i> Ait.]	Crested Dwarf Iris	N /PR
<i>Iris prismatica</i> Pursh	Slender Blue Iris	N /PV
→ <i>Isoetes riparia</i> Engelm.	River-Bank Quillwort	N /PE
<i>Isotria medeoloides</i> (Pursh) Raf.	Small-Whorled Pogonia	LE/PE
<i>Itea virginica</i> L.	Virginia Willow	N /PR
<i>Juncus alpinus</i> Vill.	Richardson's Rush	N /PR
<i>Juncus balticus</i> Willd.	Baltic Rush	N /PR
<i>Juncus brachycarpus</i> Englem.	Short-Fruited Rush	N /PR
<i>Juncus brachycephalus</i> (Engelm.) Buch.	Small-Headed Rush	N /PR
<i>Juncus dichotomus</i> Ell.	Forked Rush	N /PR
<i>Juncus filiformis</i> L.	Thread Rush	N /PR
<i>Juncus greenii</i> Oakes & Tuckerm.	Green's Rush	N /PR
<i>Juncus gymnocarpus</i> Cov.	Coville's Rush	N /PE
<i>Juncus longii</i> Fern. [<i>Juncus bifloris</i> Ell.]	Rush	N /PR
<i>Juncus marginatus</i> Rostk. var. <i>marginatus</i>	Grass-Leaved Rush	N /PR
<i>Juncus militaris</i> Bigel.	Bayonet Rush	N /PT
<i>Juncus nodosus</i> L.	Knotted Rush	N /PR
<i>Juncus torreyi</i> Cov.	Torrey's Rush	N /PR

<u>Element Name</u>	<u>Common Name</u>	<u>Status: Fed./St.</u>
Koeleria cristata (L.) Pers.	Junegrass	N /PR
Kosteletzkya virginica (L.) Presl. ex. Gray	Virginia Sea-Shore Mallow	N /PR
[Kosteletzkya virginica (L.) Presl.]		
Krigia caespitosa (Raf.) Chambers	Dwarf-Dandelion	N /PR
[Krigia oppositifolia Raf.]		
Lathyrus japonicus Willd. var. glaber	Beach-Pea	N /PR
Ledum groenlandicum Oeder	Labrador-Tea	N /PR
Leiophyllum buxifolium (Berg.) Ell.	Sand-Myrtle	N /PR
Lemna minuta HBK	Least Duckweed	N /PR
[Lemna minima Philippi]		
Lespedeza stuevei Nutt.	Tall Bush Clover	N /PR
Liatris scariosa (L.) Willd.	Gay-Feather	N /PR
var. novae-angliae Lunnell		
[Liatris novae-angliae (Lunnell) Shinners]		
Ligusticum canadense (L.) Britt.	Nondo Lovage	N /PR
Lilium michiganense Farw.	Michigan Lily	N /PV
[Gleason includes Lilium michiganense with L. superbum.]		
Limosella australis R. Br.	Awl-Shaped Mudwort	N /PX
[Limosella subulata Ives.]		
Listera australis Lindl.	Southern Twayblade	N /PT
Listera cordata (L.) R. Br.	Heart-Leaved Twayblade	N /PV
Listera smallii Wieg.	Kidney-Leaved Twayblade	N /PE
Lithospermum carolinense (Walt.) MacMill.	Gromwell	N /PR
Lobelia dormanna L.	Water Lobelia	N /PR
Lobelia kalmii L.	Brook Lobelia	N /PT
Lobelia nuttallii R. & S.	Nuttall's Lobelia	N /PR
Lobelia puberula Michx.	Downy Lobelia	N /PR
Lonicera oblongifolia	Swamp Fly Honeysuckle	N /PR
Ludwigia polycarpa Short & Peter	False Loosestrife Seedbox	N /PR
Ludwigia sphaerocarpa Ell.	Spherical-Fruited Seedbox	N /PR
Luzula bulbosa (Wood) Rydb.	Common Wood-Rush	N /PR
[Luzula campestris (L.) DC var. bulbosa Wood]		
Lycopodium complanatum L.	Trailing Clubmoss	N /PR
Lycopodium sabinifolium Willd.	Fir Clubmoss	N /PX
[Lycopodium sabiniaefolium Willd.]		
Lycopodium selago L. [Gleason includes Lycopodium porophyllum with Lycopodium selago.]	Mountain Clubmoss	N /PE
Lygodium palmatum (Bernh.) Sw.	Hartford Fern	N /PR
Lyonia mariana (L.) D. Don.	Stagger-Bush	N /PR
Lythrum hyssopifolia L.	Hyssop Loosestrife	N /PR
Magnolia tripetala L.	Umbrella-Tree	N /PR
Marshallia grandiflora Beadle & Boynton	Large-Flowered Marshallia	N /PT
Matelea carolinensis (Jacq.) Woods	Milkvine	N /PR
[Gonolobus carolinensis (Jacq.) Schult.]		
Megalodonta beckii (Torr. ex. Spreng)	Beck's Water-Marigold	N /PR
Greene var. beckii		
[Bidens beckii Torr. ex. Spreng]		

Element Name	Common Name	Status: Fed./St.
<i>Micranthemum micranthemoides</i> (Nutt.) Wettst [<i>Hemianthus micranthemoides</i> Nutt.]	Nuttall's Mud-Flower	C2/PX
<i>Mitella nuda</i> L.	Naked Bishop's-Cap	N /PR
<i>Monarda punctata</i> L.	Spotted Bee-Balm	N /PR
<i>Montia chamissoi</i> (Ledeb. ex. Spreng) Greene [<i>Montia chamissoi</i> (Ledeb.) Rob. & Fern.]	Chamisso's Miner's Lettuce	N /PX
<i>Muhlenbergia asperifolia</i> (Nees & Meyen) Parodi	Alkali Muhly	N /PR
<i>Muhlenbergia capillaris</i> (Lam.) Trin.	Short Muhly	N /PR
<i>Muhlenbergia uniflora</i> (Muhl.) Fern. (Lunnell) Shinners]	Fall Dropseed Muhly	N /PR
<i>Myrica heterophylla</i> Raf. [Gleason includes <i>Myrica heterophylla</i> with <i>Myrica pennsylvanica</i> .]	Evergreen Bayberry	N /PR
<i>Myriophyllum farwellii</i> Morong.	Farwell's Water-Milfoil	N /PR
<i>Myriophyllum heterophyllum</i> Michx.	Broad-Leaved Water-Milfoil	N /PR
<i>Myriophyllum tenellum</i> Bigel.	Slender Water-Milfoil	N /PR
<i>Nelumbo lutea</i> (Willd.) Pers	American Lotus	N /PV
<i>Nuphar luteum</i> (L.) Sibthorp & Sm. spp. <i>pumilum</i> (Timm.) E. O. Beal [Gleason recognizes this as two species: 1. <i>Nuphar microphyllum</i> (Pers.) Fern. 2. <i>Nuphar rubrodiscum</i> Morong]	Yellow Cowlily	N /PR
<i>Nymphoides cordata</i> (Ell.) Fern.	Floating-Heart	N /PR
<i>Oenothera argillicola</i> Mackenzie	Shale Barren Evening-Primrose	N /PR
<i>Oenothera pilosella</i> Raf.	Evening-Primrose	N /PR
<i>Onosmodium virginianum</i> (L.) A.D.C.	Virginia False-Gromwell	N /PR
<i>Oryzopsis pungens</i> (Torr. ex. Spreng) A. S. Hitch [<i>Oryzopsis pungens</i> (Torr.) Michx.]	Slender Mountain-Ricegrass	N /PR
<i>Pachistima canbyi</i> Gray [<i>Pachystima canbyi</i> Gray]	Canby's Mountain-Lover	C2/PE
<i>Panax quinquefolius</i> L. [<i>Panax quinquefolium</i> L.]	Wild Ginseng	N /PV
<i>Panicum amarum</i> Ell. var. <i>amarulum</i> H. & C. [<i>Panicum amarulum</i> Hitchc. & Chase]	Southern Sea-Beach Panic-Grass	N /PR
<i>Panicum rigidulum</i> Bosc. ex. Nees [<i>Panicum longifolium</i> Torr.]	Long-Leaved Panic-Grass	N /PR
<i>Phoradendron serotinum</i> (Raf.) M.C. Johnston [<i>Phoradendron flavescens</i> (Pursh) Nutt.]	Christmas Mistletoe	N /PV
<i>Phyllanthus caroliniensis</i> Walt.	Carolina Leaf-Flower	N /PR
<i>Pilea fontana</i> (Lunnell) Rydb.	Lesser Clearweed	N /PR
<i>Platanthera cristata</i> (Michx.) Lindl. [<i>Habenaria cristata</i> (Michx.) R. Br.]	Crested Yellow Orchid	N /PT
<i>Platanthera dilatata</i> (Pursh) Lindl. ex. Beck var. <i>dilatata</i> [<i>Habenaria dilatata</i> (Pursh) Hook]	Leafy White Orchid	N /PV
<i>Platanthera leucophaea</i> (Nutt.) Lindl. [<i>Habenaria leucophaea</i> (Nutt.) Gray]	Prairie White-Fringed	C1/PX

<u>Element Name</u>	<u>Common Name</u>	<u>Status: Fed./St.</u>
<i>Poa autumnalis</i> Muhl. ex. Ell. [<i>Poa autumnalis</i> Muhl.]	Autumn Bluegrass	N /PR
<i>Poa paludigena</i> Fern. & Wieg.	Prairie Bluegrass	C2/PT
<i>Poinsettia heterophylla</i> (L.) Klotzsch & Garcke [<i>Euphorbia heterophylla</i> L.]	Spurge	N /PR
<i>Polemonium vanbruntiae</i> Britt. [<i>Polemonium van-bruntiae</i> Britt.]	Jacob's Ladder	N /PR
<i>Polygala cruciata</i> L.	Cross-Leaved Milkwort	N /PR
<i>Polygala incarnata</i> L.	Pink Milkwort	N /PR
<i>Polygala lutea</i> L.	Yellow Milkwort	N /PX
<i>Polygonum ramosissimum</i> Michx.	Bushy Knotweed	N /PR
<i>Populus balsamifera</i> L.	Balsam Poplar	N /PV
<i>Potamogeton confervoides</i> Reichenb. [<i>Potamogeton confervioides</i> Reichenb.]	Tuckerman's Pondweed	N /PT
<i>Potamogeton friesii</i> Rupr.	Fries' Pondweed	N /PR
<i>Potamogeton gramineus</i> L.	Grassy Pondweed	N /PR
<i>Potamogeton hillii</i> Morong.	Hill's Pondweed	C2/PT
<i>Potamogeton obtusifolius</i> Mert. & Koch.	Blunt-Leaved Pondweed	N /PR
<i>Potamogeton praelongus</i> Wulfen.	White-Stemmed Pondweed	N /PR
<i>Potamogeton pulcher</i> Tuckerm.	Spotted Pondweed	N /PR
<i>Potamogeton tennesseensis</i> Fern.	Tennessee Pondweed	N /PR
<i>Potamogeton vaseyi</i> Robbins	Vasey's Pondweed	N /PR
<i>Potentilla anserina</i> L.	Silverweed	N /PR
<i>Potentilla fruticosa</i> L.	Shrubby Cinquefoil	N /PR
<i>Potentilla paradoxa</i> Nutt. ex. Torr. & Gray [<i>Potentilla paradoxa</i> Nutt.]	Bushy Cinquefoil	N /PR
<i>Potentilla tridentata</i> (Soland) Ait. [<i>Potentilla tridentata</i> Soland.]	Three-Toothed Cinquefoil	N /PT
<i>Prenanthes racemosa</i> Michx.	Glaucous Rattlesnake-Root	N /PE
<i>Prosperpinaca pectinata</i> Lam.	Comb-Leaved Mermaid-Weed	N /PR
<i>Prunus maritima</i> Marsh	Beach Plum	N /PR
<i>Prunus nigra</i> Ait.	Canada Plum	N /PR
<i>Prunus pumila</i> L.	Sand Cherry	N /PR
<i>Ptilimnium capillaceum</i> (Michx.) Raf.	Mock Bishop-Weed	N /PR
<i>Pycnanthemum pycnanthemoides</i> (Leavenw.) Fern.	Southern Mountain-Mint	N /PR
<i>Pycnanthemum torrei</i> Benth.	Torrey's Mountain-Mint	N /PR
<i>Pyrularia pubera</i> Michx.	Buffalo-Nut	N /PR
<i>Quercus falcata</i> Michx.	Oak	N /PR
<i>Quercus shumardii</i> Buckl.	Shumard's Oak	N /PR
<i>Ranunculus hederaceus</i> L.	Long-Stalked Crowfoot	N /PX
<i>Ranunculus micranthus</i> (Gray) Nutt. ex. Torr. & Gray [<i>Ranunculus micranthus</i> Nutt.]	Small-Flowered Crowfoot	N /PR
<i>Rhexia mariana</i> L.	Maryland Meadow-Beauty	N /PR
<i>Rhododendron atlanticum</i>	Dwarf Azalea	N /PR
<i>Rhododendron calendulaceum</i> (Michx.) Torr.	Flame Azalea	N /PR

<u>Element Name</u>	<u>Common Name</u>	<u>Status:</u> <u>Fed./St.</u>
Rhynchospora capillacea Torr.	Capillary Beaked-Rush	N /PT
Rhynchospora fusca (L.) Ait. f.	Brown Beaked-Rush	N /PR
Rhynchospora gracilentia Gray	Beaked-Rush	N /PR
Ribes missouriense Nutt. ex. Torr. & Gray	Missouri Gooseberry	N /PR
[Ribes missouriense Nutt.]		
Rotala ramosior (L.) Koehne	Tooth-Cup	N /PR
Ruellia carolinensis (J.F. Gmel.) Steud	Carolina Petunia	N /PR
[Ruellia caroliniensis (Walt.) Steud.]		
Ruellia humilis Nutt.	Fringed-Leaved Petunia	N /PR
Rumex hastatulus Baldw. ex. Ell.	Heart-Winged Sorrell	N /PR
[Rumex hastatulus Baldw.]		
Sabatia campanulata (L.) Torr.	Slender Marsh Pink	N /PX
Sabatia stellaris Pursh.	Sea Pink	N /PX
→ Sagittaria calycina Engelm. var. spongiosa Engelm.	Arrow-Head	N /PE
[Sagittaria spathulata (J.G. Smith) Buch.]		
SY = Lophotocarpus spongiosus (B&B)		
→ Sagittaria subulata (L.) Buch.	Subulata Arrow-Head	N /PE
Salix amygdaloides Anderss.	Peach-Leaved Willow	N /PR
Salix candida Fluegge ex. Willd.	Hoary Willow	N /PR
[Salix candida Fluegge]		
Salix planifolia Pursh.	Tea-Leaved Willow	N /PR
Salix serissima (Bailey) Fern	Autumn Willow	N /PT
Scheuchzeria palustris L.	Pod-Grass	N /PR
Scirpus acutus Muhl. ex. Bigelow	Hard-Stemmed Bullrush	N /PR
[Scirpus acutus Muhl.]		
Scirpus ancistrochaetus Schuyler	Northeastern Bullrush	C2/PX
Scirpus fluviatilis (Torr.) Gray	River Bullrush	N /PR
Scirpus heterochaetus Chase	Slender Bullrush	N /PR
Scirpus smithii Gray	Smith's Bullrush	N /PR
Scirpus torreyi Olney	Torrey's Bullrush	N /PR
Scleria minor (Britt.) Stone	Minor Nutrush	N /PR
Scleria reticularis Michx. var. pubescens	Reticulated Nutrush	N /PR
Scleria verticillata Muhl. ex. Willd.	Whorled Nutrush	N /PT
[Scleria verticillata Muhl.]		
Sedum rosea (L.) Scop.	Roseroot Stonecrop	N /PR
Sedum telephioides Michx.	Allegheny Stonecrop	N /PR
Senecio antennariifolius Britt.	Cat's-Paw Ragwort	C2/PE
Senecio plattensis (L.) Nutt	Ragwort	N /PR
Shepherdia canadensis (L.) Nutt.	Canada Buffalo-Berry	N /PR
Sida hermaphrodita (L.) Rusby	Sida	N /PR
Sisyrinchium albidum Raf.	Blue-Eyed Grass	N /PR
Sisyrinchium arenicola Bickn.	Sand Blue-Eyed Grass	N /PR
Sisyrinchium atlanticum Bickn.	Eastern Blue-Eyed Grass	N /PR
Smilax pseudo-china L.	Greenbrier	N /PR
[Smilax tamnifolia Michx.]		

<u>Element Name</u>	<u>Common Name</u>	<u>Status:</u> <u>Fed./St.</u>
<i>Smilax pulverulenta</i> L. [<i>Smilax herbacea</i> L. var. <i>pulverulenta</i> (Michx.) Gray]	Smooth Herbaceous Greenbrier	N /PR
<i>Solidago curtsii</i> T. & G.	Curtis' Golden-Rod	N /PR
<i>Solidago erecta</i> Pursh.	Slender Golden-Rod	N /PR
<i>Solidago sempervirens</i> L.	Sea Side Golden-Rod	N /PR
<i>Solidago spathulata</i> DC spp. <i>randii</i> (Porter) Cronq. var. <i>racemosa</i> (Greene) Gleason [<i>Solidago spathulata</i> DC var. <i>racemosa</i> (Greene) Cronq.] SY = <i>Solidago racemosa</i>	Sticky Golden-Rod	N /PR
<i>Sparganium emersum</i> Rehmann	Bur-Reed	N /PR
<i>Sparganium fluctuans</i> (Morong.) Robins.	Floating Bur-Reed	N /PR
<i>Sparganium minimum</i> (Hartm.) Fries.	Small Bur-Reed	N /PR
<i>Spiraea betulifolia</i> Pall. spp. <i>corymbosa</i> (Raf.) Taylor & MacBryde [<i>Spiraea betulifolia</i> Pall. spp. <i>corymbosa</i> (Raf.) Maxim.]	<i>Spiraea</i>	N /PR
<i>Spiraea virginiana</i> Britt.	Virginia <i>Spiraea</i>	N /PT
<i>Spiranthes magnicamporum</i> Sheviak	Ladies'-Tresses	N /PT
<i>Spiranthes ovalis</i> Lindl.	October Ladies'-Tresses	N /PT
<i>Spiranthes romanzoffiana</i> Cham.	Hooded Ladies'-Tresses	N /PV
<i>Spiranthes vernalis</i> Engelm. & Gray	Spring Ladies'-Tresses	N /PT
<i>Spirodela punctata</i> (Mey) C.H. Thompson SY = <i>Spirodela oligorrhiza</i> (Kurz.) Hegelm.	Eastern Water-Flaxseed	N /PR
<i>Sporobolus clandestinus</i> (Biehler) A. S. Hitchc.	Rough Dropseed	N /PR
<i>Sporobolus cryptandrus</i> (Torr.) Gray	Sand Dropseed	N /PR
<i>Sporobolus heterolepis</i> (Gray) Gray [<i>Sporobolus heterolepis</i> Gray]	Prairie Dropseed	N /PE
<i>Stachys hyssopifolia</i> Michx.	Hyssop Hedge-Nettle	N /PR
<i>Stachys nuttallii</i> Shuttlw. ex. Benth [<i>Stachys riddellii</i> House]	Riddells' Hedge-Nettle	N /PR
<i>Stipa spartea</i> Trin.	Porcupine Needlegrass	N /PR
<i>Strophostyles leiosperma</i> (T.&G.) Piper	Slick-Seeded Wild-Bean	N /PR
<i>Stylophorum diphyllum</i> (Michx.) Nutt.	Celandine Poppy	N /PR
<i>Taenidia montana</i> (Mackenzie) Cronq.	Pimpernel	C2/PE
<i>Talinum teretifolium</i> Pursh.	Round-Leaved Fame-Flower	N /PT
<i>Thalictrum coriaceum</i> (Britt.) Small.	Thick-Leaved Meadow-Rue	N /PR
<i>Thalictrum steeleanum</i> Boivin.	Steele's Meadow-Rue	N /PR
<i>Trautvetteria carolinensis</i> (Walt.) Vail.	Carolina Tassel-Rue	N /PR
<i>Trichostema setaceum</i> Houtt.	Blue-Curls	N /PR
<i>Trifolium reflexum</i> L.	Buffalo Clover	N /PR
<i>Trifolium virginicum</i> Small	Kate's Mountain Clover	C2/PE
<i>Triglochin maritima</i> L.	Sea-Side Arrowgrass	N /PE
<i>Triglochin palustre</i> L. [<i>Triglochin palustris</i> L.]	Marsh Arrowgrass	N /PR

<u>Element Name</u>	<u>Common Name</u>	<u>Status:</u> <u>Fed./St.</u>
Trillium nivale Riddeu	Snow Trillium	N /PR
Triphora trianthophora (Sw.) Rydb.	Nodding Pogonia	N /PT
Triplasis purpurea (Walt.) Chapm.	Purple Sandgrass	N /PR
Trollius laxus Salisb.	Spreading Globe-Flower	C1/PE
Utricularia fibrosa Walt.	Fibrous Bladderwort	N /PR
Utricularia resupinata B.D. Greene	Northeastern Bladderwort	N /PR
Uvularia puberula Michx.	Mountain Bellwort	N /PR
[Uvularia pudica (Walt.) Fern.]		
Vaccinium pallidum Ait.	Blueberry	N /PR
Veronica catenata Rennell	Speedwell	N /PR
Viburnum molle Michx.	Soft-Leaved Arrow-Wood	N /PR
Viola appalachiensis Henry	Appalachian Blue Violet	N /PR
Viola brittoniana Pollard	Coast Violet	N /PE
Viola renifolia Gray	Kidney-Leaved White Violet	N /PR
Viola villosa Walt.	Hairy Violet	N /PT
Vitis rupestris Scheele	Sand Grape	N /PR
Wolffia punctata (Griseb.) Gleason	Dotted Water-Meal	N /PR
[Wolffia punctata Griseb.]		
Wolffiella gladiata (Hegelm) Hegelm.	Bog-Mat	N /PR
[Wolffiella floridana (Smith) Thompson]		
→ Zizania aquatica L.	Indian Wild Rice	N /PR

Status Definitions

Federal Status

LE = Listed Endangered
LT = Listed Threatened
PE = Proposed Endangered
PT = Proposed Threatened

C1 = USFWS information supports listing
C2 = USFWS insufficient info for listing

State Status

PX = Proposed Extirpated. Species that have disappeared from PA, but exist elsewhere.

PE = Proposed Endangered. Species in imminent danger of extinction or extirpation in PA if the deleterious factors affecting them continue to operate.

PT = Proposed Threatened. Species which may become endangered or extirpated in PA if the deleterious factors affecting them continue to operate.

PV = Proposed Vulnerable. Species not presently endangered or threatened but because of restricted geographic areas, low numbers, or exploitation may become so.

PR = Proposed Rare. Species uncommon in PA, usually because the primary range is outside the state and suitable habitat is unavailable within the state.

TU = Tentatively Undetermined



COMMONWEALTH OF PENNSYLVANIA
PENNSYLVANIA HISTORICAL AND MUSEUM COMMISSION
WILLIAM PENN MEMORIAL MUSEUM AND ARCHIVES BUILDING
BOX 1026
HARRISBURG, PENNSYLVANIA 17120

December 22, 1983

Daniel P. Mullin
387 York Road
Warminster, PA 18974

Re: ER 84-0169-017
Bike/Hike Trail along Neshaminy
Creek
Bensalem Township
Bucks County

Dear Mr. Mullin:

The above named project has been reviewed by the Bureau for Historic Preservation in accordance with Section 106 of the National Historic Preservation Act of 1966, Executive Order 11593 and the regulations of the Advisory Council on Historic Preservation (36 CFR 800).

The Bureau for Historic Preservation reviews proposed projects for their potential effect upon both historic and archeological resources.

In our opinion this project will have no effect on historic resources.

There is a high probability that archeological resources may be affected by this project. A survey or limited testing of the area should be undertaken to locate potentially significant archeological resources. Guidelines and instructions for this phase are available from this office. If you have any questions, please contact Kurt Carr at (717) 783-5216.

If you need further information in this matter, please consult Kurt Carr or Dan Deibler of the Bureau for Historic Preservation at (717) 783-8947.

Sincerely,

A handwritten signature in cursive script that reads "Donna Williams".

Donna Williams, Chief
Division of Planning & Protection
Bureau for Historic Preservation

DW:vms



CARROLL ENGINEERING CORPORATION

Consulting Engineers

387 York Road, Warminster, Pennsylvania 18974
901 Woodbine Avenue, Bensalem, Pennsylvania 19020

674-5640
638-3400

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Raymond Smith, R.S.

M E M O

TO: Deirdre Taylor
Natalie Strange
Steve Pollock
Charles Conrad

FROM: Daniel P. Mullin

RE: Neshaminy Creek Bike/Hike Trail
Bensalem Township
CEC File #3-1099

DATE: November 23, 1983

Dan Mullin and Gary Smith, of Carroll Engineering Corporation, attended the Urban Waterfront Action Group meeting on October 18th, and the Bensalem Township Parks and Recreation Board meeting on November 22nd. The following is a summary of the minutes of those two meetings.

Urban Waterfront Action Group

Members Present:

Michael Wolf, Director, Office of Public Affairs,
Delaware Valley Regional Planning Commission
Frank Ciantrani, Army Corps of Engineers
Tim Goodger, National Marine Fish Service
Bill Toffey, Philadelphia City Planning Commission
Ed Bender, DER, Bureau of Dams & Waterways Management
Roland Bergner, DER, Bureau of Dams & Waterways Management
Larry Toth, DER, Division of Coastal Zone Management
Michael Chizik, U.S. Fish and Wildlife Service

Following a presentation by Carroll Engineering Corporation, which included slides of the project area and site inventory drawings (topo, flood plain and wetlands, soils, property ownership, vegetation, etc.), the group got into a discussion

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and Florida

MEMO

Deirdre Taylor, Natalie Strange,
Steve Pollock and Charles Conrad
CEC #3-1099

November 23, 1983

Page Two

about the project. It was generally agreed upon by the group that alignment of the trail should be kept on "high ground" in areas mapped as, or possessing the potential to be wetlands.

We brought out the fact that the National Wetlands Inventory mapping, like soils mapping, is not to be construed as fixed. The mapping provides a general picture. The group agreed that prior to construction the proposed trail alignment should be staked out for field review by the Army Corps of Engineers, U.S. Fish and Wildlife Service, National Marine Fish Service, and DER. If necessary, adjustments to the alignment of the trail could then be made in the field. In order to link Neshaminy State Park and James Armstrong Memorial Park, roads must be utilized in some areas, especially the southern one third of the project area. Michael Wolf did not view this as a serious problem. People are used to using roadways for walking and cycling. We should assume that users will have common sense and be cautious while on the roads. Michael Wolf proposed, and was backed by the group, that the trail be constructed as a hiking trail, and then, in the future, be modified to handle bicycles if warranted. Other comments were:

- steep areas would be okay for hikers - could construct handrails.
- use of the existing sewer right-of-way should be pursued.
- proposed construction should not cause a change in the 100-year flood line.
- the trail should fit into a Township maintenance program.
- at some places, a floating drum boardwalk on the creek could be used (would be expensive).
- acquisition of permits from the Army Corps and DER will be necessary prior to construction.

MEMO

Deirdre Taylor, Natalie Strange,
Steve Pollock, and Charles Conrad

CEC #3-1099

November 23, 1983

Page Three

Bensalem Township Parks and Recreation Board

Members Present:

Russell Manning, Chairman

Jack Maher

Robert Stahl

Steve Pollock, Acting Director

Carroll Engineering Corporation gave a presentation. Issues addressed at the Urban Waterfront Action Group meeting were incorporated. The Board agreed that constructing a hike trail first, and modifying it for bicycles later, is a realistic approach. We discussed how construction of the project could be phased. The project could be broken into three phases beginning with Phase One at Armstrong Park. The development of Armstrong Park will be important to the success of the trail. After reviewing slides of the Totem Road, Bristol Pike intersection, it was determined that an attempt should be made to construct the hike trail under the Bristol Pike Bridge. Steve Pollock and Russ Manning personally observed this area during one of the site visits. A Township resident in attendance commented that his wife frequently drives to Neshaminy State Park to take a hike. He said she would welcome the availability of another hiking area. The resident questioned the possibility of erosion problems in areas of wet soil.

Commonwealth of Pennsylvania
Environmental Resources
December 9, 1983

In reply refer to
RM-WR
CZ 4:UW

Subject: UWAG Meeting: Neshaminy Creek Bike/Hike Trail
October 18, 1983: Minutes

To: File CZ 4:UW

From: Lawrence Toth *Lawrence Toth*
Monitoring and Consistency Specialist

Dan Mullen and Gary Smith, Carroll Engineers, briefed the group on a proposed CZM funded bike/hike trail in Bensalem Township along Neshaminy Creek. This bike/hike trail will run between James Armstrong Memorial Park, which is another CZM funded plan, to Neshaminy State Park. This project is complimentary to the CZM funded trail in Bristol Township, discussed in September UWAG. The problem confronting the Bensalem Trail as Carroll Engineers view it, are:

- Private Ownership - Some homes are too close the waters edge, barring a bike/hike trail from being placed near the water, and
- The bike/hike trail may have to cross two or three heavily travelled roads.

The group responded with the following comments:

Frank Cianfrani - Corps of Engineers (COE)

- The COE will discourage the bike/hike trail that is proposed in wetland areas; filling wetlands for a bike/hike trail is not a water dependent use.
- If the bike/hike trail goes in or near wetland, the COE would like to see it placed on a raised structure.
- The trail appears to go over tributary streams which flow into Neshaminy Creek; to build bridges to pass over these tidal waters, a Coast Guard license/permit will be required.
- When the consultants have a good idea of the alignment of the bike/hike trail, the COE will walk it with them and tell them where COE jurisdiction is.

Mike Chezik - U.S. Fish and Wildlife

- Mr. Chezik's views were similar to the COE's.

Mike Wolf - Delaware Valley Regional Planning Commission

- Suggested use of public roads where homes' nearness to water preclude trail construction.
- Motor bikes are a problem in that area and the paved trail is just what we don't really need. Also steep grade problems exist and the walkway may not be right for this point in time given how close it will be to peoples' homes.
- Suggested only a wood chip hike trail first. It will be more acceptable to the neighbors. If all goes well, it could be paved at a later date.
- Using the existing pipeline easement is a good idea. Use the easement as much as possible.

William Toffee - Philadelphia City Planning Commission

- A water trail via canoe could also be incorporated at some points in the trail.
- Perhaps where properties/highways/grades prohibit the trail, connections with the Bristol Township bike/hike trail via crossing existing bridges can be made.

Ed Bender - DER, Bureau of Dams and Waterway Management

- Docks and boat ramps will require 105 permits as well as any other placement of material in the flood plains.
- Likes the concept of using the water pipe easements.

Larry Toth - DER, Division of Coastal Zone Management

- This project is a CZM funded project, so we have endorsed it from the start. It is part of our Providing Public Access For Recreation Policy. In addition, this project attempts to connect two park areas which is an added plus.
- CZM has a policy regarding protecting wetlands. However, as long as all environmental impacts raised by the COE, etc. can be satisfied, CZM should have no problem with this project.
- Finally, all applicants applying for a COE permit in the coastal zone must provide a consistency certification to CZM, stating that their action is consistent with the Pennsylvania Coastal Zone Management Program. CZM's determination consistency is prefaced on the successful acquisition of the State 105 permit mentioned earlier by Ed Bender. In those instances where a 105 permit is not required, CZM will conduct an independent review to determine consistency. In the case of the federal license or permit that may be required from the Coast Guard for the bridge over navigable waters, CZM will also perform an independent review.



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Consulting Engineers

387 York Road, Warminster, Pennsylvania 18974 674-5640
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Frederick C. Payne, R.S.
Raymond Smith, R.S.

M E M O

TO: File

FROM: Daniel P. Mullin

RE: Neshaminy Creek Bike/Hike Trail
Bensalem Township
CEC File No. #3-1099

DATE: December 14, 1983

The Neshaminy Creek Bike/Hike Trail was as item on the agenda of the Bensalem Township Parks and Recreation Board meeting of December 13, 1983. Present at the meeting was:

Russell Manning, Chairman, Parks and Recreation Board
Jack Maher, Member
Robert Stahl, Member
Steve Pollack, Acting Director, Parks and Recreation
Deidre Taylor, DER, CZM
David Fuller, Bucks County Planning Commission
Gary Smith, Carroll Engineering Corporation
Daniel Mullin, Carroll Engineering Corporation

The draft report was discussed/critiqued.
Dee Taylor provided CEC with a "marked up" copy of the report with comments and suggestions. David Fuller had comments and will follow up with a letter.

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COUNTY OF BUCKS

BUCKS COUNTY PLANNING COMMISSION

22-28 South Main Street, Doylestown, Pa. 18901
215/348-2911

County Commissioners

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CARL F. FONASH

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Acting Chairman

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Carl N. Wallnau, Jr.

RECEIVED

December 14, 1983

DEC 19 1983

Mr. Dan Mullen
Carroll Engineering Corporation
387 York Road
Warminster, PA 18974

UNIVERSITY MICROFILMS

RECEIVED

DEC 19 1983

RE: Draft of "Neshaminy Creek Bike/Hike Trail"

UNIVERSITY MICROFILMS

Dear Dan:

This letter is the result of my review of your plan "Neshaminy Creek Bike/ Hike Trail." In general, I am pleased that Bensalem Township is looking into what can be an exciting project — connecting Armstrong Park and Neshaminy Park by means of bike/hike trail that also gives the public access to the natural areas along Neshaminy Creek. Your work, especially in the inventories of property ownership and natural features and in the coordination with agencies having interest or jurisdiction in the area, seems to be thorough. The following are more specific comments and suggestions.

1. You may wish to indicate on the location map and discuss in the text other important land uses that exist nearby. Such land uses might include other parks, schools, large housing developments, and major employers that may be linked with the proposed trail by various kinds of bikeways.
2. Commuting cyclists should be addressed as potential users of the bike trail, for two reasons. One is that Federal Highway Administration funding may be contingent upon commuters' use of the trail. The second reason is that both commuting and recreational cyclists can be compatible users of the trail (not to mention that it would be impossible to prohibit one or the other from using the trail). It is not necessarily true that commuters travel faster than recreational cyclists; rather, the skill of the cyclist and the design speed at which the trail is engineered are the major determinants of cycling speed. (And room for safe passing, ie., a 10- to 12-foot-wide trail is the best way to accommodate cyclists traveling at very different speeds.)


Mr. Dan Mullen
December 14, 1983

Page 2 of 2

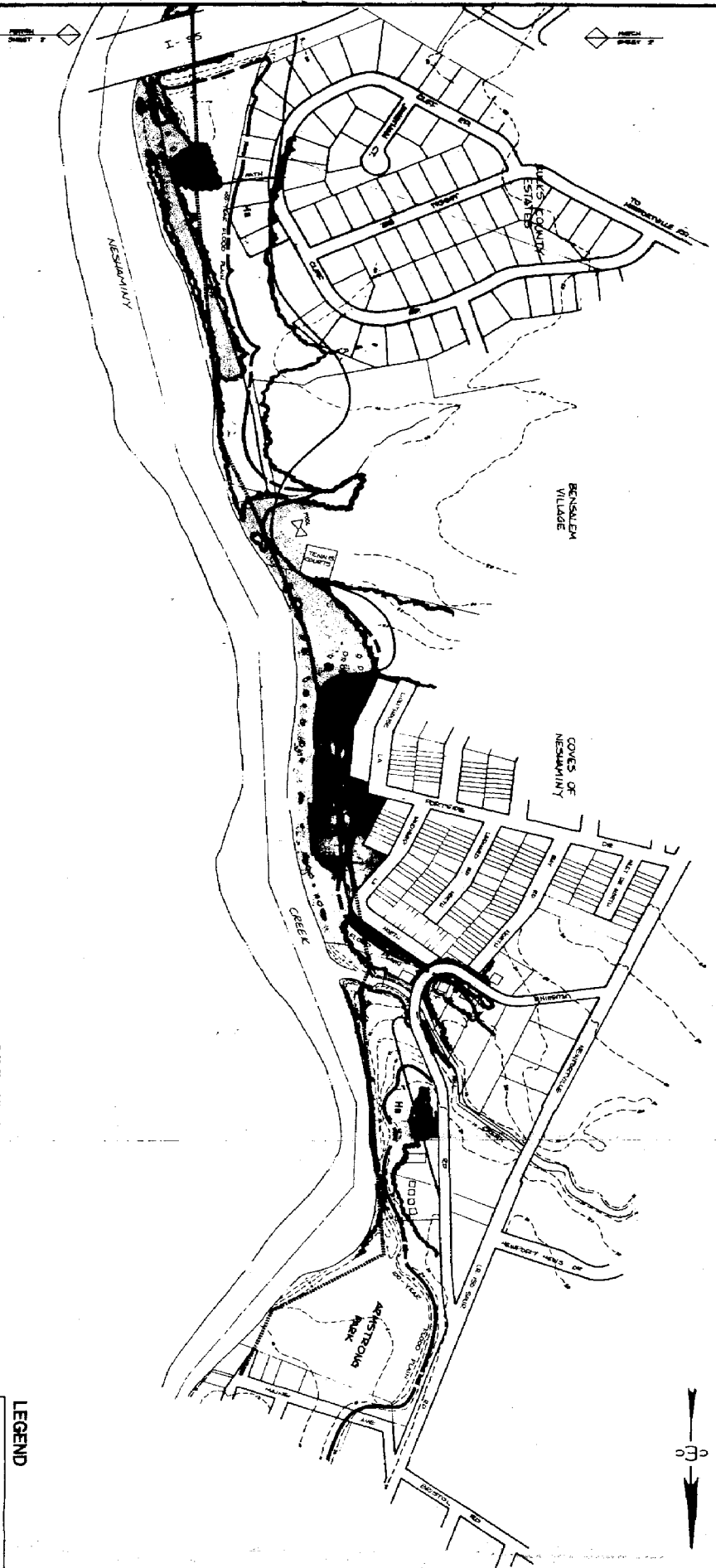
3. The proposed parking in Bucks County estates should be considered carefully. On the one hand, it may create a traffic problem in that development, which we must assume will eventually be fully developed; also, the residents of Bucks County Estates may object to the public traversing their subdivision. (In fact, Cliff and Jason drives have not been dedicated to the township, and the owner has the right to prohibit access by the general public.) The township police, township planning commission, and developer and residents of Bucks County Estates should be able to give you some insights into this question. On the other hand, the parking lot may not be necessary: it is hidden within a residential development, and less than three miles separates the parking areas at Armstrong and Neshaminy parks.
4. The 8-foot width shown in the typical section of the trail is probably too narrow. For this and other design features, you should consult "Guide for Development of New Bicycle Facilities, 1981" by the American Association of State Highway and Transportation Officials. This booklet contains design standards used by the Federal Highway Administration and the Pennsylvania Department of Transportation. (At PennDCT, contact Tom Kotay at Room 917, Transportation and Safety Building, Harrisburg, PA, 17120; telephone - (717) 787-2358.)
5. It would be helpful if your report mentioned some of the important signs to be used on the trail: for example, at each end of the trail, along shared roadways, and at street crossings.
6. The plan shows the bike trail crossing two major streets at grade: State Road (12,700 average daily traffic in 1979) and Bristol Pike (12,400 average daily traffic in 1979). The report should discuss how these intersections are to be handled. The discussion should include the feasibility of the trail passing under the bridge at Bristol Pike as an alternative to the at-grade intersection, if this is physically possible.
7. A major element of the trail is the bridge to be constructed on Totem Road. Construction bids for this bridge are to be accepted in the summer of 1984. The report should mention this and encourage the design of the bridge to be adequate to accommodate the type of bikeway you intend for Totem Road.
8. The report should address the issue of maintenance operations along the trail. Specifically, if township vehicles are to travel on parts of the trail, the designs of these sections should reflect this use.

If you have any questions about these comments, please feel free to contact me. I look forward to seeing further drafts of your report.

Sincerely,


David P. Fuller
Community Planner

DPF/bjh



Soil Classification
 Aa - Alluvial gravelly sand - 0 to 3 percent slope
 Ts - Tullahoma silt loam - gravelly subsoil
 Ts - Tullahoma silt loam - gravelly subsoil
 Ts - Tullahoma silt loam
 Ts - Tullahoma silt loam
 Ts - Tullahoma silt loam

LEGEND

- BCWASA SEWER
- TREES
- SCRUB
- GRASS
- SWAMP
- SOIL LINE AND CLASSIFICATION



CARROLL ENGINEERING CORPORATION
 CONSULTING ENGINEERS
 WARRINGTON, PENN.

NESQUEHONY CREEK BRIDGE TRAIL

SITUATED IN

NESQUEHONY TOWNSHIP, SULLY COUNTY, PENNSYLVANIA

EXISTING FEATURES PLAN

MADE FOR:
 NESQUEHONY TWP. BOARD OF SUPERVISORS
 NESQUEHONY, PENNSYLVANIA

REVISED 12-20-85

DATE 12-20-85
 DRAWN BY JAL
 CHECKED BY JAL
 SCALE 1"=40'
 SHEET 1 OF 1



NESHAMANY CREEK BIKE/HIKE TRAIL

SITUATED IN

SENSEALE TOWNSHIP, BUCKS COUNTY, PENNSYLVANIA

EXISTING FEATURES PLAN

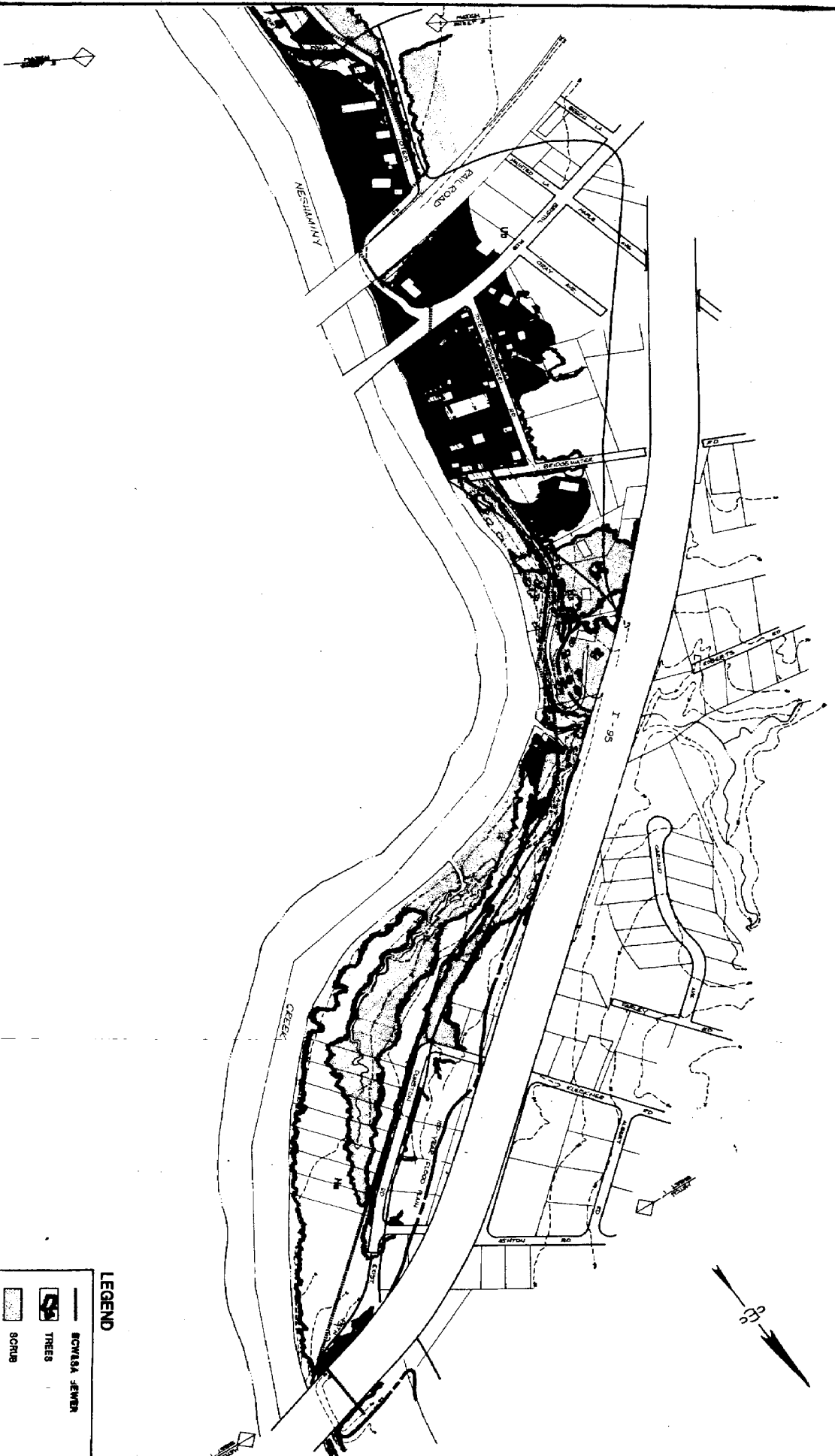
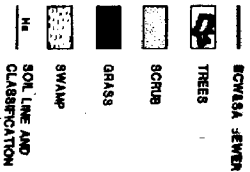
MADE FOR:

DEJALLET, PENNYLYANA

RECEIVED 12-20-83

DATE	12-1-68
JOB NO.	8-1048
DRAWING NO.	C25-C8
SHEET 2 OF	11
SCALE	1"=8'
COR. BY	PPH
OWN. BY	PHO
DWG. BY	QAB

LEGEND





CARROLL ENGINEERING CORPORATION
CONSULTING ENGINEERS
WARMUNSTER
PENN.

NESHAMINY CREEK BIKE/HIKE TRAIL

SITUATED IN
BENSALEM TOWNSHIP, BUCKS COUNTY, PENNSYLVANIA

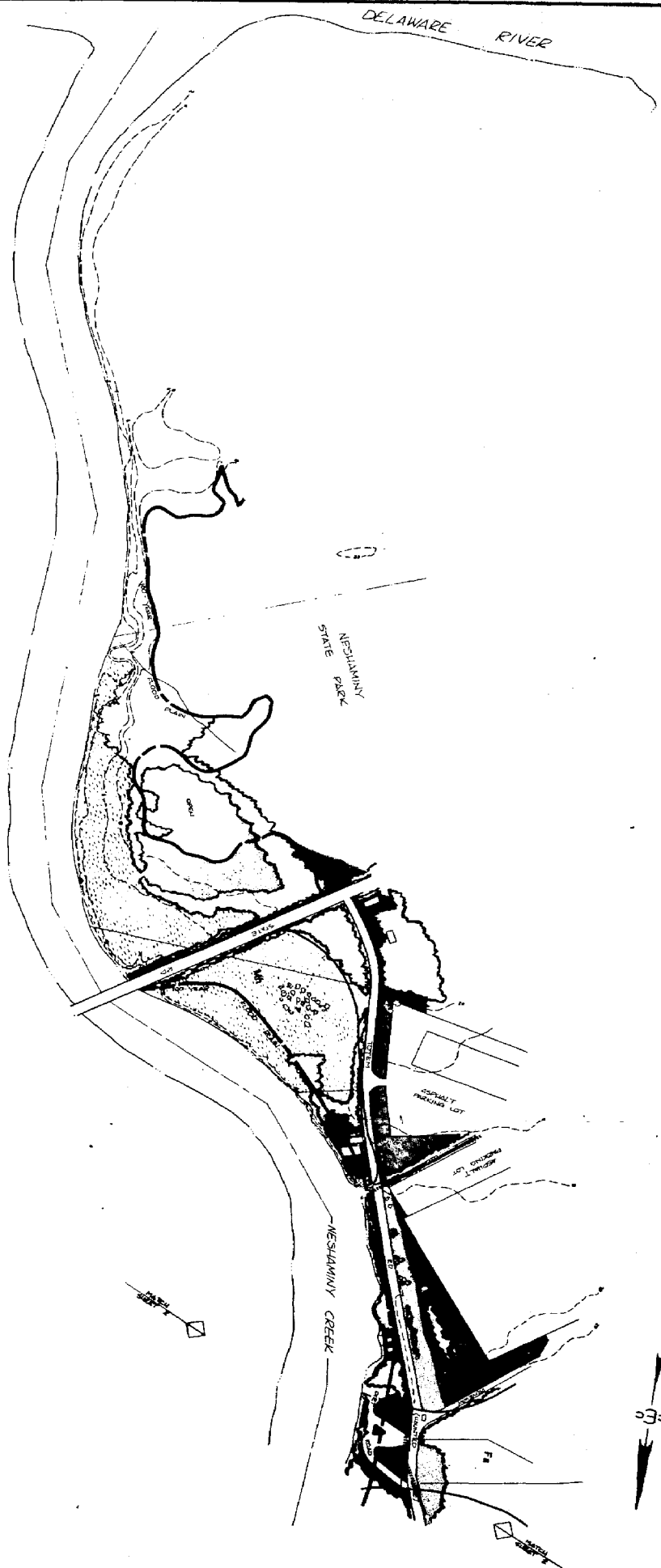
EXISTING FEATURES PLAN

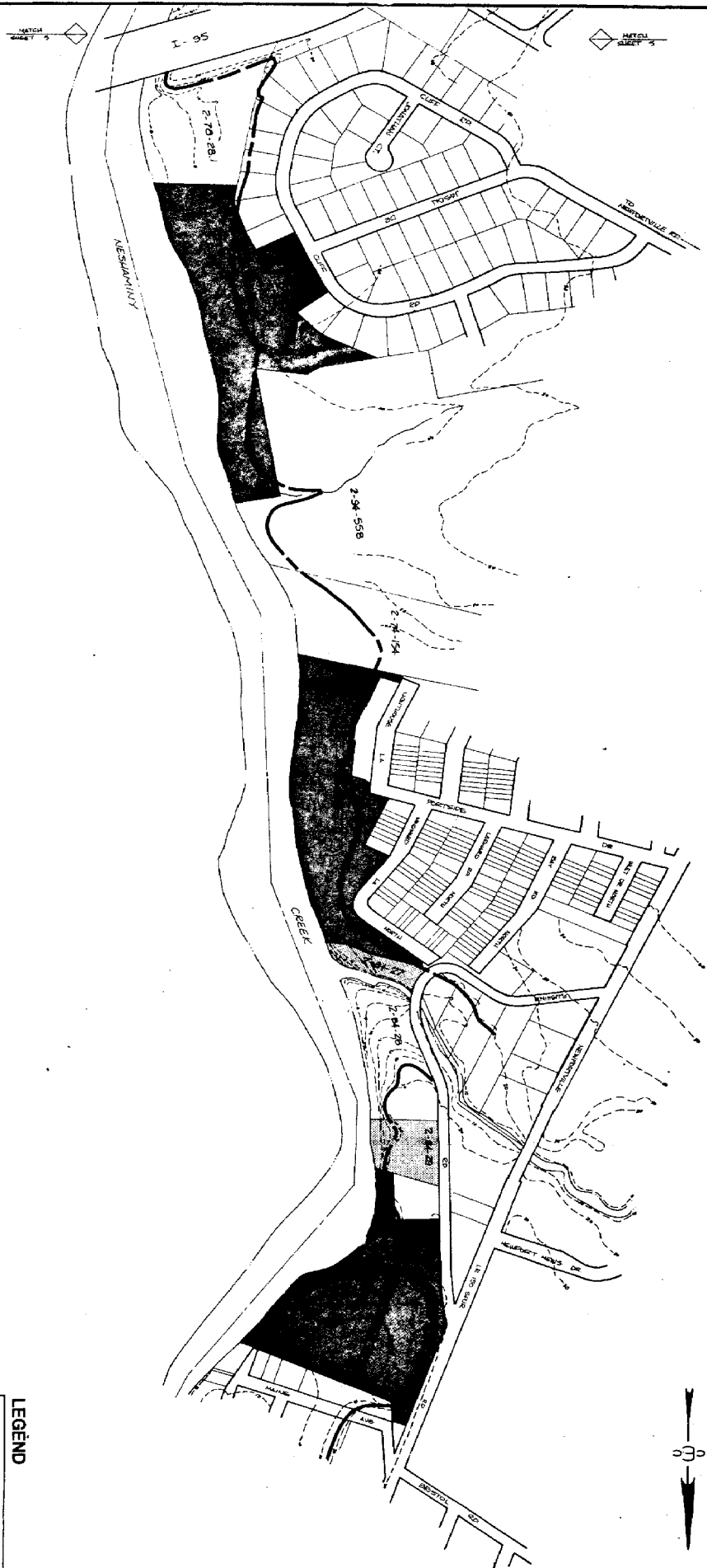
MADE FOR:
BENSALEM TWP. BOARD OF SUPERVISORS
BENSALEM, PENNSYLVANIA

DWG. BY: JAS
CHKD. BY: JAS
SCALE: 1" = 40'
DATE: 11-1-83
JOB NO. 8-1088
DRAWING NO. C-23-108
SHEET 1 OF 1

REVISED 12-20-83

- LEGEND**
- BACKSAW SEWER
 - TREES
 - SCRUB
 - GRASS
 - SWAMP
 - SOIL LINE AND CLASSIFICATION





LEGEND

- | | |
|---------|----------------------------|
| 2-90-26 | TAX PARCEL NUMBER |
| | STATE OR TOWNSHIP LANDS |
| | PRIVATE OWNERSHIP OCCUPIED |
| | PRIVATE OWNERSHIP VACANT |

REVISED 12-20-89



CARROLL ENGINEERING CORPORATION
CONSULTING ENGINEERS
WARMINSTER
PENN.

MESHAMINY CREEK BIKE/HIKE TRAIL

SITUATED IN

BENSALLEN TOWNSHIP, RUCKS COUNTY, PENNSYLVANIA

PROPERTY OWNERSHIP PLAN

MADE FROM:

BENSALLEN TWP. BOARD OF SUPERVISORS
BENSALLEN, PENNSYLVANIA

DES. BY	<u>SAS</u>	DATE	<u>12-1-89</u>
DWN. BY	<u>JMS</u>	JOB NO.	<u>8-1088</u>
CRD. BY	<u>DEB</u>	DRAWING NO.	<u>C23-128</u>
SCALE	<u>1"=400'</u>	SHEET	<u>1</u> OF <u>12</u>



CARROLL ENGINEERING CORPORATION
CONSULTING ENGINEERS
WARRMINSTER
PENNA.

NESHAMINY CREEK BKE/HKE TRAIL

SITUATED IN

BENSALEM TOWNSHIP, BUCKS COUNTY, PENNSYLVANIA

PROPERTY OWNERSHIP PLAN

MADE FOR:

BENSALEM TWP. BOARD OF SUPERVISORS
BENSALEM, PENNSYLVANIA

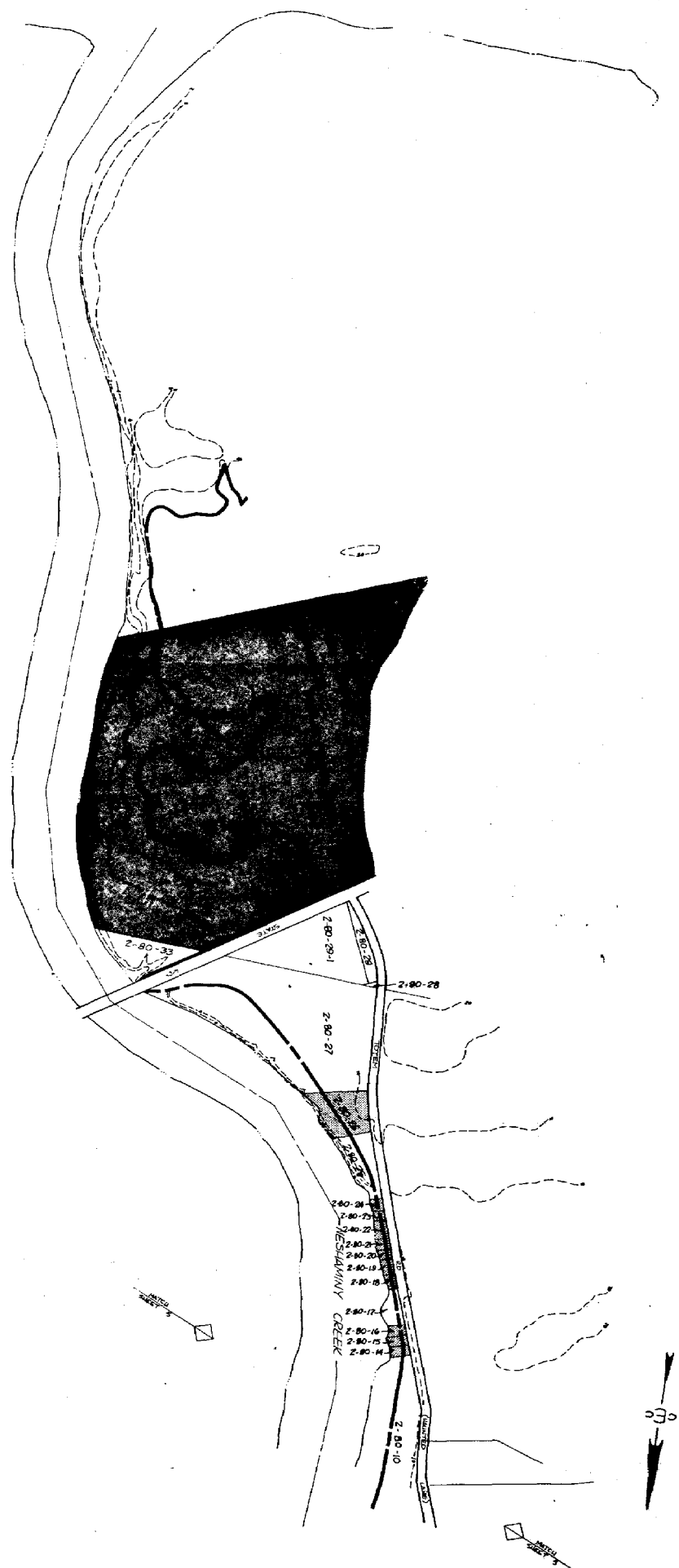
DWG. BY JAB
CHKD. BY JAB
SCALE 1"=400'

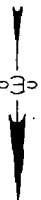
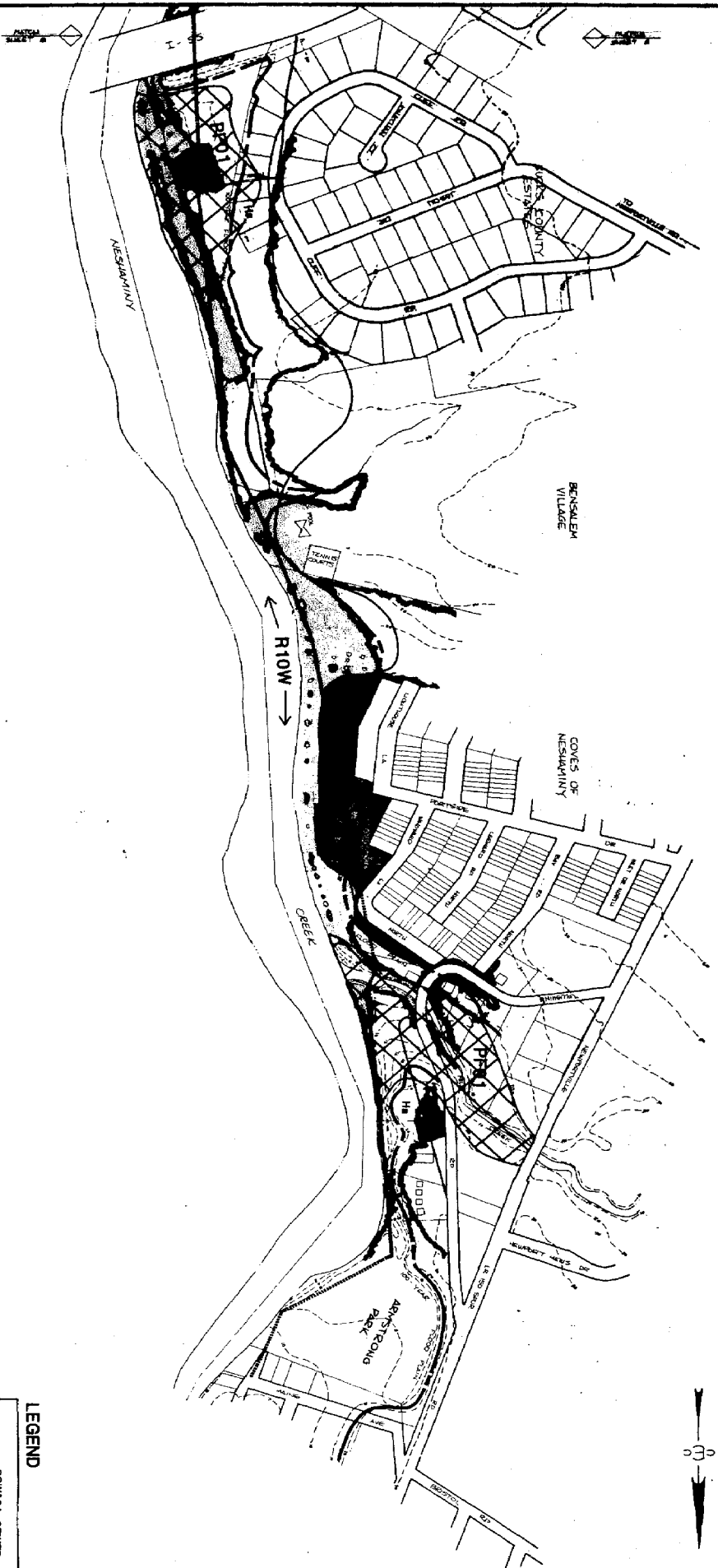
DATE 12-1-88
JOB NO. 8-1888
DRAWING NO. 553-100
SHEET 1 OF 12

REVISED 12-20-84

- 2-80-26 TAX PARCEL NUMBER
STATE OR TOWNSHIP LANDS
PRIVATE OWNERSHIP OCCUPIED
PRIVATE OWNERSHIP VACANT

LEGEND





LEGEND

	BCWSA SEWER
	TREES
	BRUSH
	GRASS
	MARSH
	SOIL LINE AND CLASSIFICATION
	EXISTING CONTOUR

R10W

ECOLOGICAL SYSTEM - RIVERINE
ECOLOGICAL SUBSYSTEM - TIDAL
CLASS - OPEN WATER/UNKNOWN BOTTOM

PFO1

ECOLOGICAL SYSTEM - PALUSTRINE
ECOLOGICAL SUBSYSTEM - (NONE)
CLASS - FORESTED
SUBCLASS - BROADLEAFED DECIDUOUS

REVISED 12-20-03

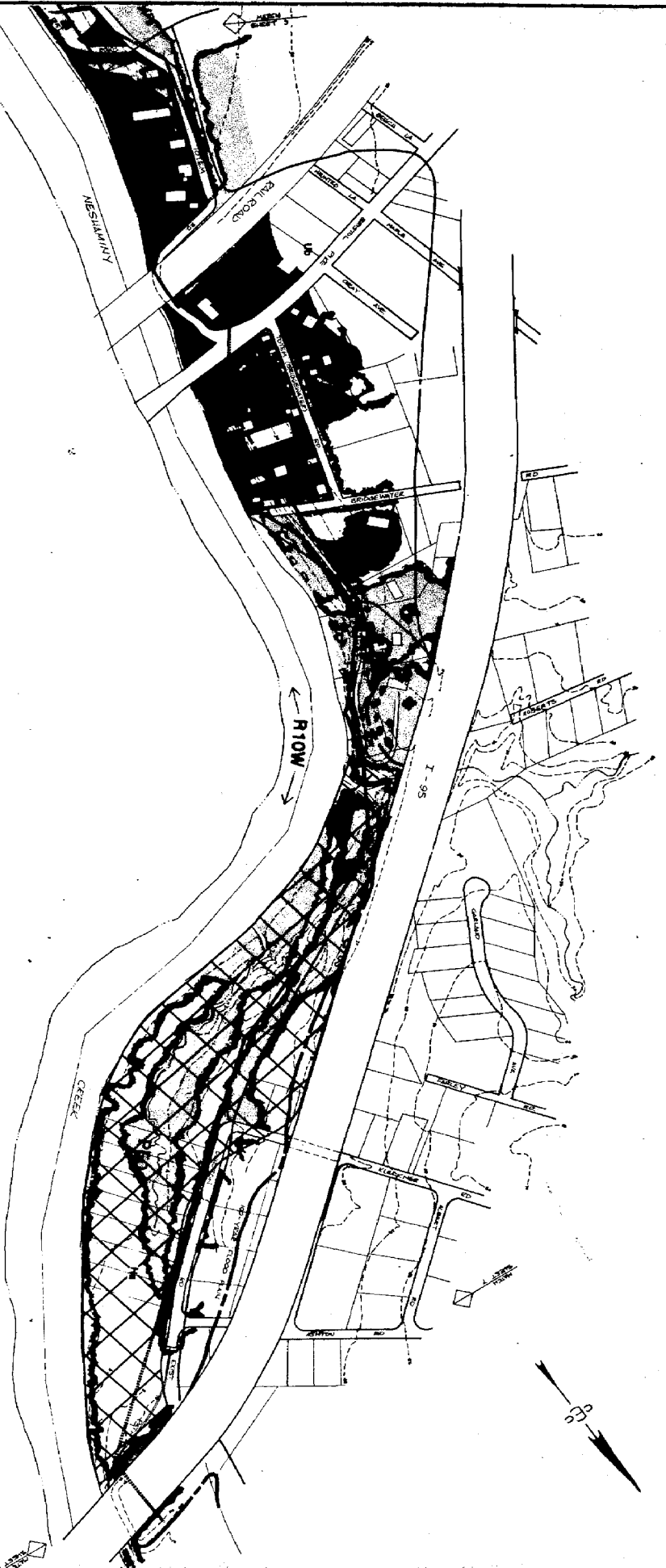


CARROLL ENGINEERING CORPORATION
CONSULTING ENGINEERS
WARMINSTER
PENN.

NESHAMINY CREEK BIKE/HIKE TRAIL
SITUATED IN
BENSALEM TOWNSHIP, BUCKS COUNTY, PENNSYLVANIA

NATIONAL WETLANDS INVENTORY
MADE FOR
BENSALEM TWP. BOARD OF SUPERVISORS
BENSALEM, PENNSYLVANIA

DWG. BY JMS
CHKD. BY DBL
SCALE 1"=100'
DATE 12-1-03
JOB NO. 03-038
DRAWING NO. 03-038
SHEET 1 OF 12



R10W
 ECOLOGICAL SYSTEM - RIVERINE
 ECOLOGICAL SUBSYSTEM - TOTAL
 CLASS - OPEN WATER/UNKNOWN BOTTOM

PFO1
 ECOLOGICAL SYSTEM - PALUSTRINE
 ECOLOGICAL SUBSYSTEM - (NONE)
 CLASS - FORESTED
 SUBCLASS - BROAD-LEAVED DECIDUOUS

LEGEND

- BOWASA SEWER
- TREES
- BRUSH
- GRASS
- MARSH
- SOIL LINE AND CLASSIFICATION
- EXISTING CONTOUR



CARROLL ENGINEERING CORPORATION
 CONSULTING ENGINEERS
 WARM/INSTER
 PENN.

NESHAMINY CREEK BIKE/HIKE TRAIL

SITUATED IN

BENSALEM TOWNSHIP, BUCKS COUNTY, PENNSYLVANIA

NATIONAL WETLANDS INVENTORY

MADE FOR

BENSALEM TWP. BOARD OF SUPERVISORS
 BENSALEM, PENNSYLVANIA

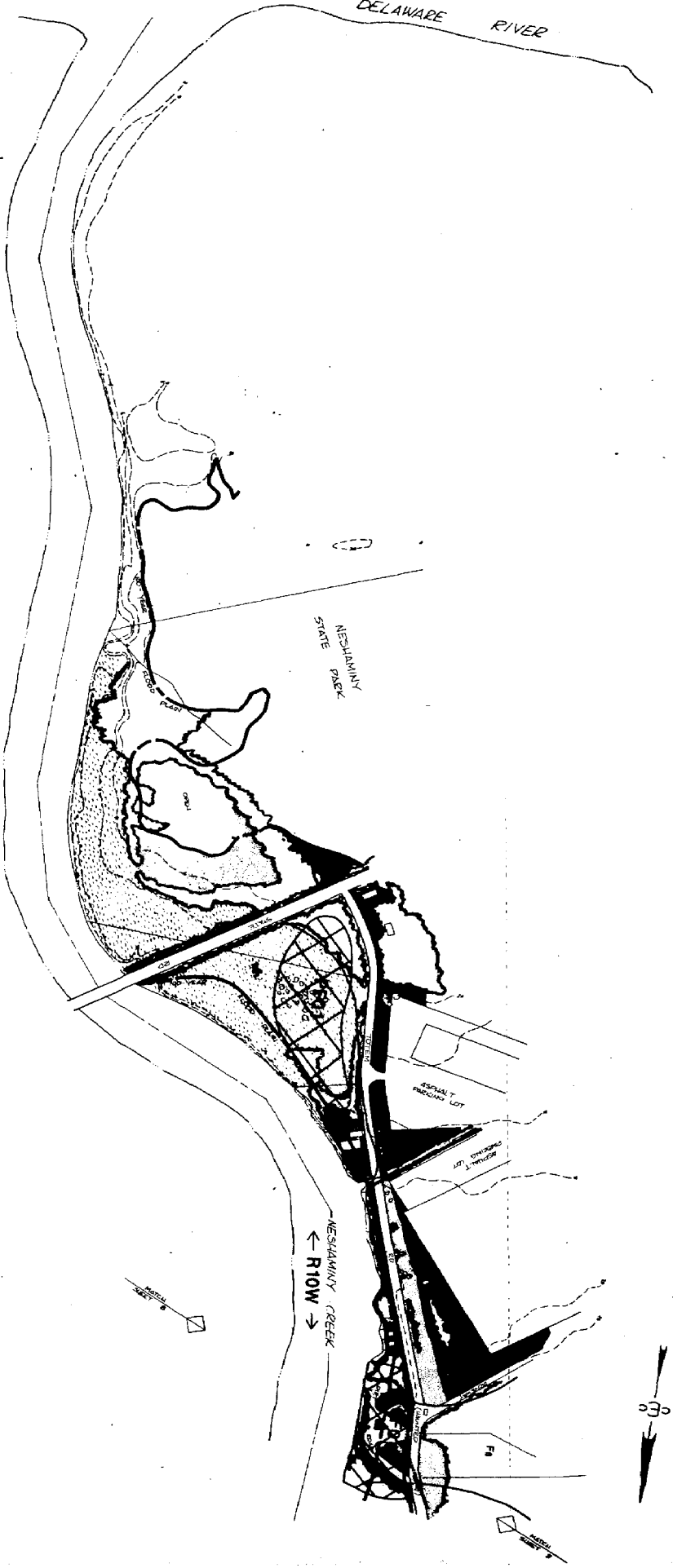
REVISED 12-20-93

DWG. BY JES DATE 12-1-93
 CDD. BY JES JOB NO. 57-1883
 SCALE 1"=400' DRAWING NO. CDD-100
 SHEET 1 OF 13

DELAWARE RIVER

NESHAMINY
STATE PARK

NESHAMINY CREEK
← R10W →



R10W

ECOLOGICAL SYSTEM - RIVERINE
ECOLOGICAL SUBSYSTEM - TIDAL
CLASS - OPEN WATER/UNKNOWN BOTTOM

PFO1

ECOLOGICAL SYSTEM - PALUSTRINE
ECOLOGICAL SUBSYSTEM - (NONE)
CLASS - FORESTED
SUBCLASS - BROAD LEAVED DECIDUOUS

LEGEND

- COWASA SEWER
- TREES
- BRUSH
- GRASS
- MARSH
- SOIL LINE AND CLASSIFICATION
- EXISTING CONTOUR



CARROLL ENGINEERING CORPORATION
CONSULTING ENGINEERS
WARRMINSTER
PENN.

NESHAMINY CREEK BIKE/HIKE TRAIL
SITUATED IN

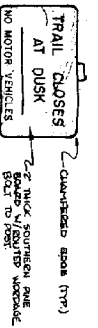
BENSALEN TOWNSHIP, BUCKS COUNTY, PENNSYLVANIA

NATIONAL WETLANDS INVENTORY

MADE FOR
BENSALEN TWP. BOARD OF SUPERVISORS
BENSALEN, PENNSYLVANIA

REVISED 12-20-85

DWG. BY JHE
CHKD. BY JHE
SCALE 1" = 400'
DATE 12-1-85
JOB NO. 2-108
DRAWING NO. 23-108
SHEET 2 OF 12



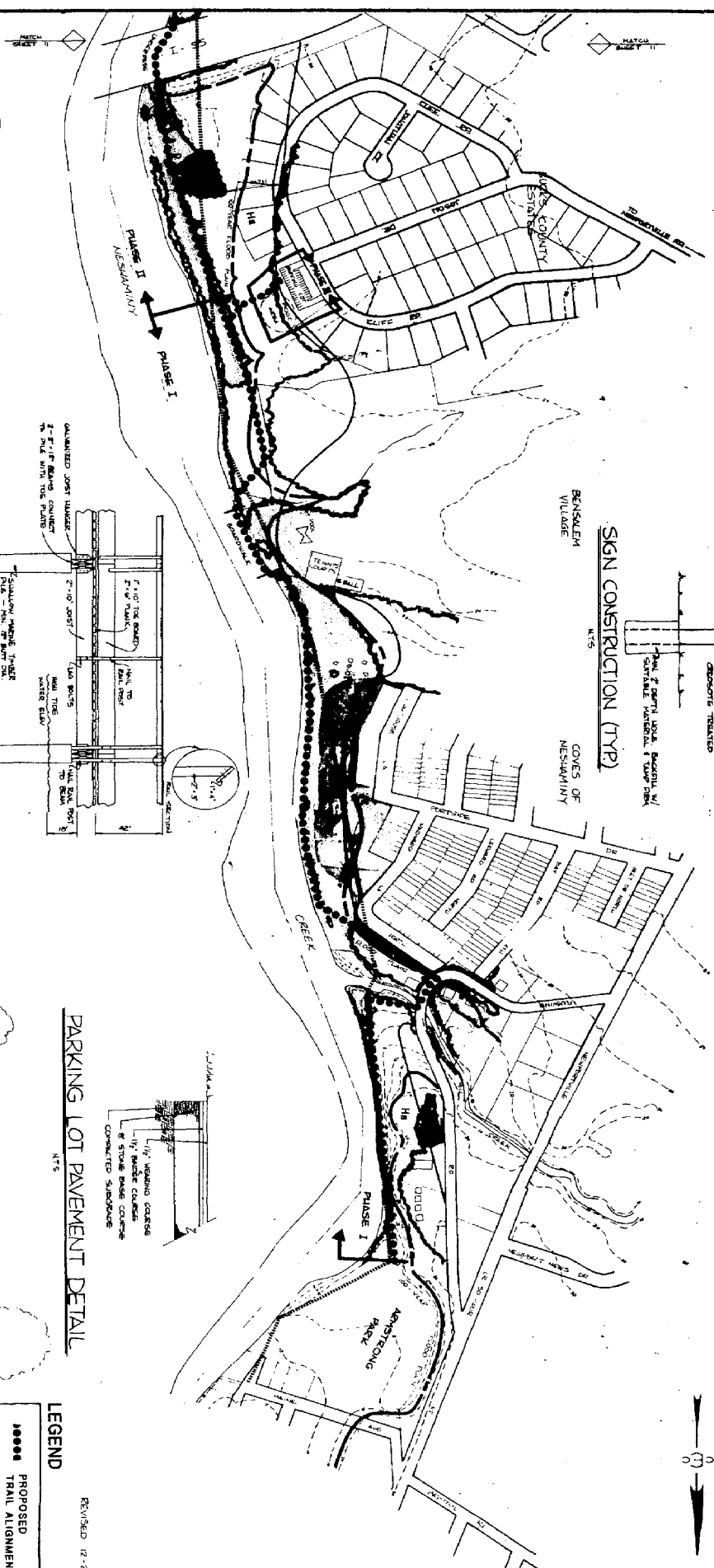
SIGN CONSTRUCTION (TYP)

BENSALEM VILLAGE

N.T.S.

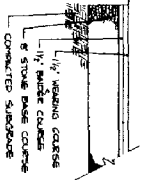
1" = 4' (SEE NOTE: BENCH MARK W/ QUANTIFIABLE MATERIAL & TYPICAL SIGN)

1" = 4' (SEE NOTE: BENCH MARK W/ QUANTIFIABLE MATERIAL & TYPICAL SIGN)



PARKING LOT PAVEMENT DETAIL

N.T.S.

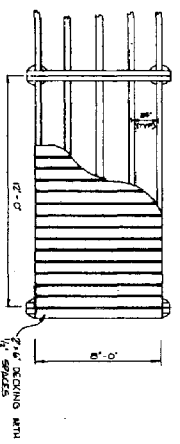


LEGEND

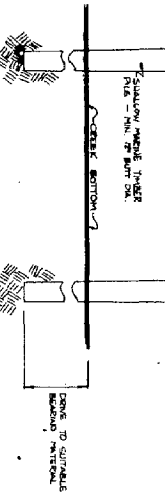
REVISED 12-20-93

- PROPOSED TRAIL ALIGNMENT
- BOWMAN SEWER
- TREES
- SCRUB
- GRASS
- SWAMP
- SOIL LINE AND CLASSIFICATION
- EXISTING CONTOUR

PLAN VIEW



SIDE VIEW

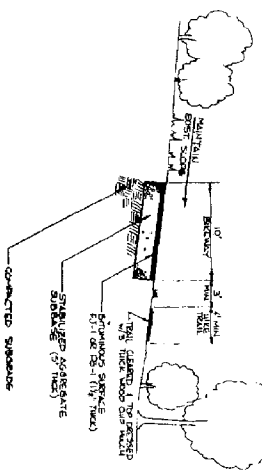


BOARDWALK DETAIL

N.T.S.

BIKE/HIKE TRAIL DETAIL

N.T.S.



NESHAMINY CREEK BIKE/HIKE TRAIL

SITUATED IN

BENSALEM TOWNSHIP, BUCKS COUNTY, PENNSYLVANIA

SITE DEVELOPMENT PLAN

MADE FOR: BENSAMIN TWP. BOARD OF SUPERVISORS

BENSALEM, PENNSYLVANIA



CARROLL ENGINEERING CORPORATION
CONSULTING ENGINEERS
WARMINTER
PENN.

DATE: 12-1-93
JOB NO: 3-1088
DRAWING NO: C23-108
SHEET 10 OF 13



CARROLL ENGINEERING CORPORATION
CONSULTING ENGINEERS
WARMINSTER
PENN.

NESHAMINY CREEK BIKE/HIKE TRAIL

SITUATED IN

BENSALEM TOWNSHIP, BUCKS COUNTY, PENNSYLVANIA

SITE DEVELOPMENT PLAN

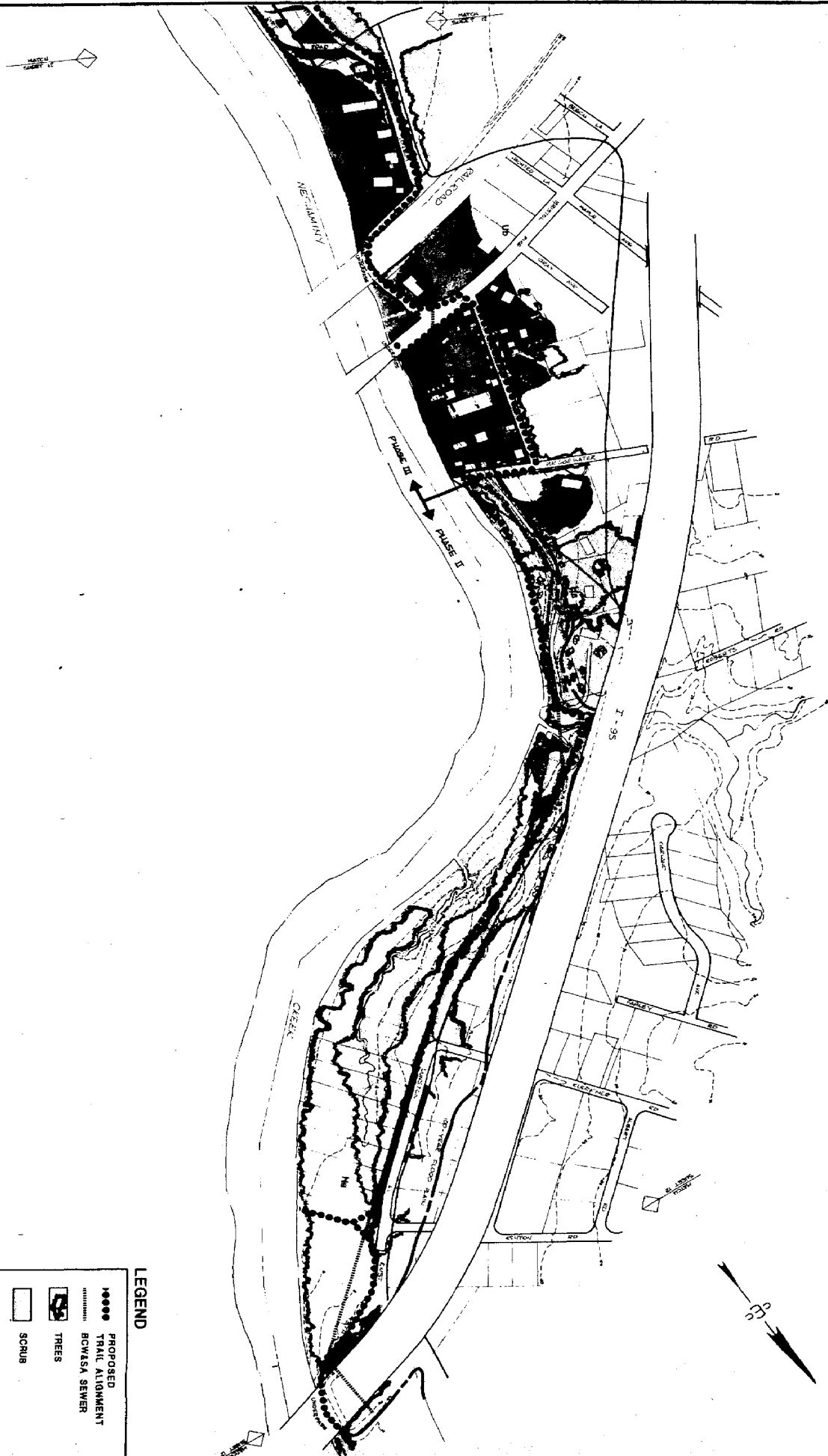
MADE FOR
BENSALEM TWP. BOARD OF SUPERVISORS
BENSALEM, PENNSYLVANIA

DWG. BY: JAS
CHKD. BY: JAS
SCALE: 1"=40'
DATE: 12-1-88
JOB NO.: 8-1000
DRAWING NO.: 22-08
SHEET 11 OF 13

REVISED 12-20-85

LEGEND

- PROPOSED TRAIL ALIGNMENT
- EXISTING BOWASA SEWER
- TREES
- SCRUB
- GRASS
- SWAMP
- SOIL LINE AND CLASSIFICATION
- EXISTING CONTOUR





CARROLL ENGINEERING CORPORATION
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PENN.

NESHAMINY CREEK BIKE/HIKE TRAIL

SITE DEVELOPMENT PLAN

SITUATED IN
BENSALEM TOWNSHIP, BUCKS COUNTY, PENNSYLVANIA

MADE FOR:
BENSALEM TWP. BOARD OF SUPERVISORS
BENSALEM, PENNSYLVANIA

DWG. BY GAB
CHKD. BY JHB
DATE 12-1-88
JOB NO. 2-1088
DRAWING NO. 2-1088
SHEET 12 OF 13
SCALE 1"=400'

REVISED 12-30-88

LEGEND

- PROPOSED TRAIL ALIGNMENT
- BOWASA SEWER
- TREES
- SCRUB
- GRASS
- SWAMP
- BOULDER LINE AND CLASSIFICATION
- EXISTING CONTOUR

